Catalog of Courses

WILLIAMSPORT TECHNICAL INSTITUTE
WILLIAMSPORT, PENNSYLVANIA

1962

WILLIAMSPORT TECHNICAL INSTITUTE

WILLIAMSPORT, PENNSYLVANIA

Founded 1920

ANNOUNCEMENT OF COURSES

in

VOCATIONAL AND TECHNICAL EDUCATION

1962-63

A DIVISION OF THE SCHOOL

DISTRICT OF THE CITY OF WILLIAMSPORT

SCHOOL DISTRICT OF WILLIAMSPORT

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1962

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BRIEF HISTORY

The Williamsport Technical Institute had its beginning in 1914 as a small industrial arts shop of the Williamsport High School. Following World War I there was the problem of retraining veterans, many of them disabled, and this led to the establishment of the adult day school on a full-time basis. A shop for this training was set up in an old building. At this time, too, an adult evening school was started and this has continued to the present time.

In the early 20's the day school program was changed from industrial arts to vocational education. During the depression in the 30's, the adult program pioneered in vocational training to help alleviate the unemployment problem. The success of this program was soon evident and this led to training for the CCC, NYA, and WPA. In 1932 there was a shortage of good truck drivers and this school borrowed trucks and set up a driver training course which was the first of its kind in the country. This course evolved into the present day safe driving course which is a part of many high school curriculums.

In June of 1940 an extensive program of training for defense industries was set up. During World War II, to meet the demands of industry, the school was operated on a 24-hour a day schedule.

It was in 1941 that the adult program was established as the Williamsport Technical Institute. Through the experiences of retraining of the physically disabled during the 30's and 40's, this program was expanded in cooperation with the Pennsylvania Bureau of Rehabilitation and more handicapped men and women were trained for war production. Today the Institute has one of the largest programs for training and retraining of physically handicapped persons in the United States.

The school made plans for the training of returned service men even before the G. I. Bill of Rights was passed in 1944. To date over 6500 World War II and Korean veterans have been enrolled in various courses at the Institute.

The Institute has grown from early days and at the present time the adult enrollment is approximately 1000 students who attend on a 30-hour per week basis. In addition, approximately 500 high school boys and girls from several school districts obtain their vocational-technical .ining at the Institute.

CAMPUS

The Institute today consists of seven buildings located on approximately thirty-nine acres which include the aviation hangar and shop facilities located on nine acres on the Williamsport Municipal Airport.

OBJECTIVES

The Institute has dedicated itself to the principle that vocational education should fit itself to the needs of the individual, the community, and the nation. The staff is continually working on the revision of its

courses to keep them up to date with the latest trends, practices, and equipment.

As a part of the public school system of the city of Williampsort, Pennsylvania, it is first obligated to provide educational services for its citizens and for its employers. It has been conditioned through the years to the extent that its courses are occupationally minded. The students are being educated for jobs. To a considerable extent the instruction is based on "live" projects. It is a working school.

The Full-Time Adult Program is presently operated mainly in the day time, but in a few cases full-time adult classes are scheduled on a second shift, and in one case on a third shift. This is because facilities are not adequate to handle the demand for these courses on one shift. It is expected that more second-shift and third-shift full-time classes will be scheduled in the future.

The Evening Program is a part-time trade extension program providing extension classes for apprentices, supervisors, and other employees who desire to increase their skills or acquire new skills and understandings. This program usually operates from October 1 through March 30.

The Summer Program is a continuation of the full-time adult program which operates throughout the year. The Institute closes for two weeks for a summer vacation.

Continuing Program—All courses taught at the Institute are considered to be a part of the continuing educational program of the students. It is expected that the students who complete their work at the Institute will continue their education on their jobs, in this and other educational institutions as needed to advance in their position and in their communities.

None of the courses offered at this school carry transfer credit which may be applied at degree-granting colleges and universities.

Guidance and Counseling are available to students enrolled in the various courses. This service is for students who find that they desire to change courses, students who are not doing satisfactory work in their courses, and students who wish to explore the use of their abilities and interests.

The Vocational Diagnostic Program is a four-week vocational counseling program. It is a planned program of aptitude testing, counseling, job orientation, and job trials.

The team approach of giving help to the individual is used in this program and the entire program is planned to give the individual an opportunity to decide what his best vocational possibilities are. The course is so managed that it can be tailored to fit the needs of the individual.

During the first week of the program the group is taken on a complete tour of the school, and in each department the members are given

occupational information and description of the vocations for which the course gives preparation. The remaining three weeks are spent in job trials by the individual in the various departments of the school. At the conclusion of the course the individual meets with the counselors and instructors to arrive at a recommendation.

The tuition for this four-week program is $70.00.

Reservations for this program must be made in advance because the program is scheduled on a four-week basis.

Scholarships—A limited number of scholarships are available at times to students in training in some of the occupational courses. The amount may vary according to the wishes of the concern involved, but generally such scholarships would at least cover tuition cost.

Health and Safety—The Institution has an industrial nurse on duty in the first aid department to care for any slight accident. Any serious accident is referred to the Williamsport Hospital. The Institute is safety conscious and attempts to exceed all health, safety, and fire regulations.

WHO MAY ENROLL

Enrollment is open to both men and women of good character who are at least 17 years of age and who can demonstrate through the aptitude tests that they have the potential ability to benefit from this training.

The school reserves the right to dismiss any student who does not make satisfactory progress or whose conduct is not in keeping with the school standards.

HOW TO ENROLL

Candidates for admission should file an application and make arrangements to take the required aptitude tests.

APPLICATION FORMS

Application Forms may be obtained by writing or calling the Registrar, 1005 West Third Street, Williamsport, Pennsylvania. The telephone number is Williamsport 322-4691.

APTITUDE TEST INFORMATION

Aptitude tests are required for all applicants. Veterans who are eligible for training under the G. I. Bill may take these tests through the V. A. in which event the veteran should request that his test results be forwarded to this school.

Applicants who are eligible for training under the War Orphans Act (PL634) must take the tests through the V. A.

A mimeographed schedule of the dates that the aptitude tests will be given has been inserted in this catalogue.

The applicant for testing should report to the Registrar's Office at 1005 West Third Street not later than 12:45 in the afternoon on the

scheduled test date. Since prior notice is not required, a candidate may report for testing on any of the scheduled testing dates which would be most convenient for him.

There is a fee of $5.00 for the test. This is payable at the time the applicant takes the test.

An application should be submitted at least two weeks before the aptitude test is taken in order that we may first determine whether the candidate can otherwise qualify.

The results of the tests will usually be mailed to the candidate within four weeks from the date the test was taken.

REGISTRATION FEE

Each student will be required to pay a $10.00 registration fee the day he enrolls. This fee is not refundable.

PERSONAL INTERVIEW

Although a personal interview is not required, it is suggested that if at all possible, the candidate should make an appointment to come for an interview. Interview appointments should be requested well in advance of the date that the applicant prefers to come.

Appointments for these interviews may be scheduled by writing or calling the Registrar, 1005 West Third Street, Williamsport, Pennsylvania. Our telephone number is Williamsport 322-4691.

VISITING HOURS

The school is in session Monday through Friday from 8:45 a. m. to 3:21 p. m. for visits.

Appointments should be made in advance. These appointments may be made by writing or calling the Registrar.

ROOM AND BOARD

Room and board is available within easy walking distance of the school. A list of available rooms may be obtained at the Registrar's Office. The cost of room and board is approximately $15 to $20 per week. Rooms alone will cost approximately $4 to $6 per week. These costs will vary, of course, with the different types of accommodations.

STUDENT INSURANCE

Student Accident Insurance is available for all students.

INSTITUTE POLICY AND REGULATIONS

a. Enrollment Dates and Entrance Requirements.

The school operates throughout the year.

A student may enroll at any time when there is a vacancy in the course he wants to take.

Students will be notified far enough in advance as to when they should report for enrollment so as to allow them ample time to take care of their personal affairs before enrolling.

b. Leave, Absences, Class Cuts, Make-up Work, Tardiness, and Unsatisfactory Attendance.

No provisions are made for making up absence and students are dropped from the roll if the absence is excessive. All absences must be explained and approved when the student returns to the school. Students will be terminated after three days of unexcused absence.

Tardiness of up to 15 minutes is excused. Tardiness of over 15 minutes will be deducted at the rate of one (1) hour for each hour or portion of an hour above 15 minutes.

Veterans and War Orphans Tardiness—An occasional tardiness (not more than two per week) of one-half hour or less need not be counted if it is excused by the school or established in accordance with its policy as approved by the State Approving Agency. Tradiness which is not excused and tardiness of more than one-half hour, whether excused or not, shall be counted as one or more hours of absence. Absences during any portion of the day shall be counted, whether more or less than an hour. All early departures shall be counted even though the absence is excused. Any absence of less than an hour shall be counted as a full hour of absence.

Make Up Work—Make up work is not permitted for the purposes of receiving veterans administration training allowances.

c. Standards of Progress.

The grading system is as follows: 3—excellent, 2—good, 1—average, 0—below average, and -1—failure.

Two consecutive months of failing grades, due to conditions within the student's control, shall be a basis for dismissal.

Students dismissed for unsatisfactory progress may be readmitted through an agreement between the school, student, and Veterans Administration as to future progress.

The school maintains progress records on all students and copies of same kept on a monthly basis are given to the student every three months and at the conclusion of their training.

d. Student Conduct.

All students are expected to cooperate with school regulations and apply themselves to the best of their ability in their studies.

Students will be dismissed from school when it is found that they cannot profit by the instruction, are non-cooperative, or otherwise fail to abide by the school regulations.

e. Refund Policy

The policy of the Williamsport School Board relative to the refund of the unused portion of tuition, fees, etc., in the event the student does

not enter the course, withdraws, or is discontinued therefrom is as follows:

A student leaving the Institute without notice or failure to report after enrolled will be charged three days tuition. A student who terminates and gives notice of his termination will receive all of his unused portion of tuition.

f. Credit for Previous Education and Training

Credit for previous education and training for units of work in the courses offered by this school will only be given by making a grade of average or better on tests on the particular unit or units of work for which credit is requested.

g. Cooperative Programs

A cooperation program may be worked out in each course with business or industry which is interested in completing the training on an on-the-job basis in the plant. Such programs shall complete the units of work required in the completion of the course as outlined in this catalog. The school will maintain supervision of the program in the plant to assure that the training will be real and substantial.

All students within all courses will be eligible to go on a cooperative basis upon the completion of at least one half of the course within the school. The remaining one half or smaller percentage of time may be spent in the on-the-job training in the same course with the company. In all cases the Williamsport Technical Institute must first approve the company and their proposed on-the-job training facilities. The company's training program must also be approved by the Department of Public Instruction, Training Facilities for Veterans Divisions, Harrisburg, Pennsylvania.

Upon the completion of the entire course on this basis, the student will receive a certificate of course completion from the Institute the same as any other graduate who completes his course.

h. Time of Classes

All classes with the exception of second and third-shift classes are operated from 8:45 a. m. until 3:21 p. m. Second-shift classes are operated from 3:30 p. m. until 10:00 p. m. Veterans on second shift are scheduled from 3:30 p. m. until 9:30 p. m. Third-shift classes are operated from 10:00 p. m. until 4:30 a. m. Veterans are not permitted to enroll on third shift.

Where previous courses have been reduced in total hours, credit will be allowed to students hour for hour, up to the new total specified per unit.

i. Certificate

A certificate of course completion will be granted upon the full completion of the prescribed course of study, providing the following requirements have been met:

It is expected that any student who desires a certificate of course completion in any course containing the word "technical" will have a grade

average of "2" or better for the last six months that the student is in attendance in his course.

No student completing his course with less than an average grade of "1" will be granted a certificate of completion. He will be given a certificate of hours; however it will not be a full certificate suitable for framing.

SHOP DRESS

All new students will be required to wear standardized shop clothing. This clothing may be rented through the Student Council or purchased, if the student desires, from a store of his choice.

Aviation—White Coveralls

Machine Shop—White Shop Apron

Plumbing—Dark Green Coveralls

Masonry—White Coveralls

Welding—Dark Green Coveralls

Sheet Metal—White Shop Coat

Motor Rewinding—White Shop Coat

Electric Shop—White Shop Coat

Carpenter—White Shop Apron

Pattern Shop—White Shop Apron

Automotive—Dark Green Coveralls

Diesel—Dark Green Coveralls

Heavy Equipment Construction—Dark Green Coveralls

Office Machine Serviceman—White Shop Coat

Printing—Apron to be supplied by department

Electronics—Dress Shirts required including necktie for the winter months

Drafting—Dress Shirts required including necktie for the winter months

Business—Dress Shirts required including necktie for the winter months.

AVAILABLE SPACE AND FACILITIES

	No. Square Ft.
Automotive Department (Total of 22,900 sq. ft.)	
Automotive Mechanic	9500 sq. ft.
Automotive Technician	9500 sq. ft.
Diesel Mechanic	6400 sq. ft.
Diesel Technician	6400 sq. ft.
Heavy Construction Equipment Operator and Serviceman	7000 sq. ft.
Aviation Department (Total of 17,735 sq. ft.)	
Airframe Mechanic	8867 sq. ft.
Powerplant Mechanic	8868 sq. ft.
Business Practice Department (Total of 4,765 sq. ft.)	
Accountant	1100 sq. ft.
Business Management	640 sq. ft.
Business Administration	825 sq. ft.
Business Machines Operator	550 sq. ft.
Clerk-Typist and Receptionist	550 sq. ft.
Secretary	1100 sq. ft.
Carpentry Department (Total of 9,000 sq. ft.)	
Carpentry and Building Construction	9000 sq. ft.
Drafting Department (Total of 13,642 sq. ft.)	
Draftsman, Architectural	2440 sq. ft.
Draftsman, Mechanical	5500 sq. ft.
Layout Fabricator Technician (Pipe and Metal)	1250 sq. ft.
Technical Illustrator I	2440 sq. ft.
Technical Illustrator II	2440 sq. ft.
Tool Design Technician	1024 sq. ft.
Electrical Department (Total of 8,400 sq. ft.)	
Electrical Construction Technician	3400 sq. ft.
Electrical Instrumentation Technician	3000 sq. ft.
Electric Motor Winding and Repairs	2000 sq. ft.
Machine Shop (Total of 16,000 sq. ft.)	
Toolmaker	16000 sq. ft.
Toolmaking Technician	16000 sq. ft.
Office Machine Service (Total of 2,160 sq. ft.)	
Office Machine Serviceman	1080 sq. ft.
Office Machine Technician	1080 sq. ft.

Patternmaking Department (Total of 2,400 sq. ft.)

Patternmaker—Wood	2400 sq. ft.

Plumbing Department (Total of 1,500 sq. ft.)

Plumber	800 sq. ft.
Plumber—Lead Work	700 sq. ft.

Printing Department (Total of 5,748 sq. ft.)

Offset and Letterpress Printer	5748 sq. ft.

Radio Department (Total of 7,550 sq. ft.)

Electronics Technology	7550 sq. ft.

Sheet Metal Department (Total of 4,000 sq. ft.)

Sheet Metal Worker	4000 sq. ft.

Sign Painting and Neon Sign Department (Total of 2,640 sq. ft.)

Sign Painter	1600 sq. ft.
Neon Tube Bender	1040 sq. ft.

Welding Department (Total of 5,300 sq. ft.)

Acetylene Welder	1800 sq. ft.
Electric Welder	1800 sq. ft.
Welding Technician	1700 sq. ft.

Facilities

Visual education classrooms, technical library, school nurse and first aid rooms. School meets all requirements of the Pennsylvania Department of Labor and Industry as to adequate facilities, toilet facilities, safeguarding machines, lighting, and exits.

AUTOMOTIVE MECHANIC

This course gives a thorough preparation for entering the automotive service field. It includes a study of all types of internal combustion engines and automobile equipment.

The student is given a thorough preparation in every aspect of automotive maintenance and repair including the more specialized fields such as wheel alignment and balancing, carburetion, ignition, test tune-up procedures, brakes, and steering.

Improvements in modern automobiles and equipment require that automotive mechanics have a thorough technical training which can be secured best in a well equipped school. Both theoretical training and practical experience are given on all phases of automotive maintenance.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Hand Tools, Bench and Machine Work	100 hours
Engine Service	554 hours
Cooling System	50 hours
Transmissions and Clutches	200 hours
Steering, Suspension, Alignment and Balance	200 hours
Differentials	100 hours
Brakes	200 hours
Body, Chassis, and Accessories	150 hours
Electrical Systems	350 hours
Fuel System	200 hours
Tune-up	200 hours
Trouble Shooting	100 hours
Welding	200 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Hand Tools, Bench and Machine Work **100 hours**

Learning to use common tools and special tools of the trade, bench and machine tools for tapping, threading, reaming, grinding, honing, lapping and measuring.

Engine Service and Repair **554 hours**

Learning nomenclature, relation of parts and assemblies, measuring, installing, fitting of pistons, piston pins, and rings, bearings,

etc. Oiling system. Aligning connecting rods. Valve service. Servicing component. Timing settings.

Cooling Systems — **50 hours**

Care and service to cooling system, pressure testing of system and caps, testing thermostats, anti-freeze solutions, etc. Water pump repair.

Transmissions and Clutches — **200 hours**

Trouble shooting, installation and adjustment of clutches. Diagnosis and repair of standard units and overdrive; servicing of same. Theory, construction and operation of automatic units; adjustment of same, and where advisable, the repair and rebuilding of automatics. Servicing of automatic transmissions.

Steering, Suspension, Alignment, and Balance — **200 hours**

Complete servicing, repair, and adjustment of front suspension (and rear, where applicable) systems. Wheel balancing. Power steering services and repairs.

Differentials — **100 hours**

Service and repair of differential units, including interlocking types. Care and repair of rear wheel bearings and seals.

Brakes — **200 hours**

Complete modern brake servicing—lining, bleeding, adjusting, etc. Repair of master and wheel cylinders and other hydraulic components. Power brake service.

Body, Chassis, and Accessories — **150 hours**

Body repairs such as rattles, squeaks, leaks, etc. Servicing of various power-operated accessories such as windows, convertible tops, seats, heaters, defrosters, etc. Repair of exhaust system; shock absorber service and other service items pertinent to body and/or chassis.

Electrical System — **350 hours**

Service and repair of generators, regulators, motors, batteries and all other electrical components. Ignition system service—use of modern testing and servicing equipment. Lighting and warning devices. Circuitry and print reading.

Fuel Systems — **200 hours**

Cleaning and rebuilding carburetors; adjusting same. Use of modern test and service equipment. Test and repair of fuel pumps.

Tune-up — **200 hours**

Use of modern scientific test equipment in setting up fuel and ignition for top performance. Same for generating system. Diagnosing engine condition by "reading" instruments, spark plugs and other tell-tale signs.

Trouble Shooting — **100 hours**

Diagnosis of troubles in engine, chassis or other units by scientific methods of deduction by elimination. Learning to do this rapidly and accurately.

Welding — **200 hours**

Use of oxy-acetylene equipment in cutting, welding and heating. Use of electric arc equipment in welding and cutting.

Economics and Job Procurement — **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

AUTOMOTIVE TECHNICIAN

This course gives a thorough preparation for entering the automotive service field. It includes a study of all types of internal combustion engines and automobile equipment.

The student is given a thorough preparation in every aspect of automotive maintenance and repair including the more specialized fields such as wheel alignment and balancing, carburetion, ignition, test tune-up procedures, brakes and steering.

Improvements in modern automobiles and equipment require that automotive mechanics have a thorough technical training which can be secured best in a well equipped school. Both theoretical training and practical experiences are given on all phases of automotive maintenance.

In addition to the above training, this course offers sufficient hours in mathematics, science, technical communications (English), and economics to enable a graduate to work with the engineering staff on design, testing, experimental, and other phases of manufacturing.

Length of Course ..... **3000 hours**
Duration of Course ..... **27 months**

COURSE UNITS

Hand Tools, Bench and Machine Work	100 hours
Engine Service and Repair	510 hours
Cooling System	30 hours
Transmission and Clutches	200 hours
Steering, Suspension, Alignment, and Balance	200 hours

Differentials	77 hours
Brakes	177 hours
Body, Chassis and Accessories	150 hours
Electrical Systems	350 hours
Fuel Systems	200 hours
Tune-up	200 hours
Trouble Shooting	100 hours
Welding	200 hours
Economics and Job Procurement	46 hours
Mathematics	184 hours
Science	184 hours
Technical Communications	92 hours
Total	3000 hours

COURSE OUTLINES

Hand Tools, Bench and Machine Work — **100 hours**

Learning to use common tools and special tools of the trade, bench and machine tools for tapping, threading, reaming, grinding, honing, lapping and measuring.

Engine Service and Repair — **510 hours**

Learning nomenclature, relation of parts and assemblies, measuring, installing, fitting of pistons, piston pins, and rings, bearings, etc. Oiling system. Aligning connecting rods. Valve service. Servicing components. Timing settings.

Cooling Systems — **30 hours**

Care and service to cooling system, pressure testing of system and caps, testing thermostats, anti-freeze solutions, etc. Water pump repair.

Transmissions and Clutches — **200 hours**

Trouble shooting, installation and adjustment of clutches. Diagnosis and repair of standard units and overdrive; servicing of same. Theory, construction and operation of automatic units; adjustment of same, and where advisable, the repair and rebuilding of automatics. Servicing of automatic transmissions.

Steering, Suspension, Alignment, and Balance — **200 hours**

Complete servicing, repair, and adjustment of front suspension (and rear, where applicable) systems. Wheel balancing. Power steering services and repairs.

Differentials — **77 hours**

Service and repair of differential units, including interlocking types. Care and repair of rear wheel bearings and seals.

Brakes — **177 hours**

Complete modern brake servicing—lining, bleeding, adjusting, etc. Repair of master and wheel cylinders and other hydraulic components. Power brake service.

Body, Chassis and Accessories — **150 hours**

Body repairs such as rattles, squeaks, leaks, etc. Servicing of various power-operated accessories such as windows, convertible tops, seats, heaters, defrosters, etc. Repair of exhaust system; shock absorber service and other service items pertinent to body and/or chassis.

Electrical System — **350 hours**

Service and repair of generators, regulators, motors, batteries and all other electrical components. Ignition system service—use of modern testing and servicing equipment. Lighting and warning devices. Circuitry and print reading.

Fuel Systems — **200 hours**

Cleaning and rebuilding carburetors, adjusting same. Use of modern test and service equipment. Test and repair of fuel pumps.

Tune-up — **200 hours**

Use of modern scientific test equipment in setting up fuel and ignition for top performance. Same for generating system. Diagnosing engine condition by "reading" instruments, spark plugs and other tell-tale signs.

Trouble Shooting — **100 hours**

Diagnosis of troubles in engine, chassis or other units by scientific methods of deduction by elimination. Learning to do this rapidly and accurately.

Welding — **200 hours**

Use of oxy-acetylene equipment in cutting, welding and heating. Use of electric arc equipment in welding and cutting.

Economics and Job Procurement — **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Mathematics — **184 hours**

Algebra, factoring, equations, fractions, square root, elementary trigonometry, logarithms, slide rule, sines, etc. Shop problems on slide rule.

Science — **184 hours**

General and applied science, physics, matter, force, motion, heat, frictional materials and anti-friction materials. Liquids, gases, solids. Machines—simple and complex. Hydraulics, pressure, etc.

Technical Communication 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, technical report writing.

DIESEL MECHANIC

The diesel mechanic course is the repair and operation of diesel engines and diesel powered equipment. Training covers all phases of engine service and also the servicing of the vehicles that would be diesel powered—both on-the-highway and off-highway types.

The diesel department of the Technical Institute is one of the best equipped diesel schools in the eastern United States.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Machine, Hand Tools, and Bench Work	135 hours
Principles of the Internal Combustion Engine	200 hours
Combustion, Fuels, and Fuel Injection Systems	300 hours
Diesel Starting	100 hours
Operation, Testing, and Power Measurement	200 hours
Transmission, Clutch, and Power Accessories	200 hours
Pumps, Instruments, and Auxiliary Equipment	300 hours
Maintenance of Modern Diesels	600 hours
Electric Theory and Practice	360 hours
Welding	210 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Machine, Hand Tools, and Bench Work 135 hours

Learning to use the common tools and special tools of the trade, bench and machine tools for tapping, threading, reaming, grinding, honing and measuring.

Principles of the Internal Combustion Engine 200 hours

Fundamental knowledge of the construction, nomenclature, relationship of parts and principles of engines. Disassembly, in-

spection, reassembly and operation of engines. Oiling system. Piston and connecting rod repairs. Valve service. Timing of valves and ignition.

Combustion, Fuels, and Fuel Injection Systems **300 hours**

Diesel injection, ignition, and fuel types. Pump, nozzle, injector, and governor construction, service, and repair. Adjustment of fuel system components.

Diesel Starting **100 hours**

Problems in starting. Cold weather starting procedures. Various methods of cranking diesels; maintenance of this equipment. Procedure for stopping engine.

Operation, Testing, and Power Measurement **200 hours**

Analysis of engine operation, horsepower measurement, cylinder pressure, temperature limitations, proper operational procedure. Trouble shooting engine operations. Starting and stopping procedures.

Transmission, Clutch and Power Accessories **200 hours**

Transmission repair, gear ratios, tooth pressure, etc. Service and repair of clutches. Torque converters, fluid clutches, and automatic transmission theory and service. Hydraulic systems and controls. Power take-offs. Applications of diesel engines and limitations of same.

Pumps, Instruments, and Auxiliary Equipment **300 hours**

Construction of and repair of centrifugal, positive displacement and various other types of pumps. Engine control accessories, governors, pressure and temperature cut-outs, pyrometers, thermometers, tachometers, gauges (calibration of same), manometers, etc. Servicing air compressors, purifiers and blowers.

Maintenance of Modern Diesels **600 hours**

Proper procedure in maintenance, inspection of parts, repairs and tests, analysis of malfunctions, and efficiency of making repairs. Engine and all components (such as superchargers, blowers, pumps, governors, and heat exchangers) are covered.

Electric Theory and Practice **360 hours**

Fundamentals of electricity, motors, solenoids, generators, regulators, thermo-static controls, rheostats, etc. Care and repair of same. Circuitry and print reading.

Welding **210 hours**

Use of oxy-acetylene equipment in cutting, welding, and heating. Use of electric arc equipment in welding and cutting.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

DIESEL TECHNICIAN

The diesel technician course is a practical course in the repair and operation of diesel engines and diesel powered equipment.

Training covers all phases of engine service and also the servicing of the vehicles that would be diesel powered—both on-the-highway and off-highway types.

In addition to the above training this course offers sufficient academic hours in mathematics, science, economics, and technical communication (English) to enable a graduate to work with engineers in design, experimental, testing, and other manufacturing phases.

Length of Course ..... **3000 hours**
Duration of Course ..... **27 months**

COURSE UNITS

Machine, Hand Tools, and Bench Work	103 hours
Principles of the Internal Combustion Engine	200 hours
Combustion, Fuels, and Fuel Injection Systems	277 hours
Diesel Starting	100 hours
Operation, Testing, and Power Measurement	200 hours
Transmission, Clutch and Power Accessories	200 hours
Pumps, Instruments, and Auxiliary Equipment	300 hours
Maintenance of Modern Diesels	554 hours
Electric Theory and Practice	360 hours
Welding	200 hours
Economics and Job Procurement	46 hours
Mathematics	184 hours
Science	184 hours
Technical Communications	92 hours
Total	3000 hours

COURSE OUTLINE

Machine, Hand Tools, and Bench Work 103 hours

Learning to use the common tools and special tools of the trade,

bench and machine tools for tapping, threading, reaming, grinding, honing and measuring.

Principles of the Internal Combustion Engine **200 hours**

Fundamental knowledge of the construction, nomenclature, relationship of parts and principles of engines. Disassembly, inspection, reassembly and operation of engines. Oiling system. Piston and connecting rod repairs. Valve service. Timing of valves and ignition.

Combustion, Fuels, and Fuel Injection Systems **277 hours**

Diesel injection, ignition, and fuel types. Pump, nozzle, injector, and governor construction, service, and repair. Adjustment of fuel system components.

Diesel Starting **100 hours**

Problems in starting. Cold weather starting procedures. Various methods of cranking diesels; maintenance of this equipment. Procedure for stopping engine.

Operation, Testing, and Power Measurement **200 hours**

Analysis of engine operation, horsepower measurement, cylinder pressure, temperature limitations, proper operational procedure. Trouble shooting engine operations. Starting and stopping procedures.

Transmission, Clutch, and Power Accessories **200 hours**

Transmission repair, gear ratios, tooth pressure, etc. Service and repair of clutches. Torque convertors, fluid clutches, and automatic transmission theory and service. Hydraulic systems and controls. Power take-offs. Applications of diesel engines and limitations of same.

Pumps, Instruments, and Auxiliary Equipment **300 hours**

Construction of and repair of centrifugal, positive displacement and various other types of pumps. Engine control accessories, governors, pressure and temperature cut-outs, pyrometers, thermometers, tachometers, gauges (and calibration of same), manometers, etc. Servicing air compressors, purifiers and blowers.

Maintenance of Modern Diesels **554 hours**

Proper procedure in maintenance, inspection of parts, repairs and tests, analysis of malfunctions, and efficiency of making repairs. Engine and all components (such as superchargers, blowers, pumps, governors, and heat exchangers) are covered.

Electric Theory and Practice **360 hours**

Fundamentals of electricity, motors, solenoids, generators, regulators, thermo-static controls, rheostats, etc. Care and repair of same. Circuitry and print reading.

Welding 200 hours

Use of oxy-acetylene equipment in cutting, welding, and heating. Use of electric arc equipment in welding and cutting.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Mathematics 184 hours

Algebra, factoring, equations, fractions, square root, elementary trigonometry, logarithms, slide rule, sines, cosines, etc. Shop problems on slide rule.

Science 184 hours

General and applied science, physics, matter, force, motion, heat, frictional materials, and anti-frictional materials, liquids, gases, solids, combustion. Machines—simple and complex. Hydraulics, pressure, etc.

Technical Communications 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, technical report writing.

HEAVY CONSTRUCTION EQUIPMENT OPERATOR AND SERVICEMAN

This course consists of the maintenance, servicing, and operation of heavy construction equipment such as motorized blade grader, carryall, scraper, bulldozer, ditch digger, crane, shovel, etc. The emphasis will be on repair and service to such equipment, but each qualified student will learn the essentials of operation for all types of equipment. The student will become a practical technician in earth moving.

Men who successfully complete the course will be qualified to enter the construction field as maintenance men, servicemen, or apprentice operators.

Length of Course ..... 2650 hours
Duration of Course ..... 2 years

COURSE UNITS

Machine, Hand Tools, and Bench Work ..... 134 hours
Principles of Internal Combustion Engines ..... 300 hours

Diesel Engine Maintenance	350 hours
Lubrication	210 hours
Maintenance of Equipment	700 hours
Operation of Equipment	590 hours
Rigging, Hitches, Couplings, and Slings	110 hours
Welding	210 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Machine, Hand Tools, and Bench Work **134 hours**

Use of mechanics' hand tools, use of drill press, valve refacing machine. Use of valve seat reconditioning machines. Micrometers, their care and proper usage. Surface gauge, tachometer, and engine instruments.

Principles of Internal Combustion Engine **300 hours**

Fundamentals of engine construction, nomenclature, and principles of engine operation. Methods in disassembly, inspection, and reassembly of engines. Transmission construction, principles of operation, gearing, power transmission, and couplings.

Diesel Engine Maintenance **350 hours**

Principles of diesel construction, injection, and operation, dissassembly of diesel engines, inspection of parts, proper repair procedures, and testing of engine after repair. Proper operation of diesel engines. Starting and stopping procedures, cranking devices —care and servicing

Lubrication **210 hours**

Types of lubricants, special applications of lubricants, and characteristics of lubricants. Oils and greases. Detergency. Procedures for lubricating equipment. Records of lubrication. Engine oiling systems. Filter application, care and service.

Maintenance of Equipment **700 hours**

Proper methods of repair of various types of construction equipment. Track maintenance, clutch maintenance, transmission maintenance. Power control units. Cable maintenance. Disassembly, inspection, and reassembly of dozers, surface grader, roller, etc.

Operation of Equipment **590 hours**

Proper operational procedures for construction equipment. Dozer, scraper, grader, roller, shovel, loader, ditcher, and compressor operation. Rough grading, excavations, fills, ditching, and contouring methods of operation.

Rigging, Hitches, Couplings, and Slings — **110 hours**

Safety in rigging. Ropes, knots, and cables. Directional signals and hand signals for operators and pilots. Working strength of ropes, lines, slings, splices and rigs.

Welding — **210 hours**

Fundamentals of arc and gas welding. Hard surfacing cutting edges. Cutting, burning, brazing. Pipe welding. Cast iron welding. Steel welding.

Economics and Job Procurement — **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Note: Included in the 2650 hours, 450 hours are distributed on shop theory and related subjects.

*AIRFRAME MECHANIC

This course prepares for the Civil Aeronautic Authority examination for Airframe Mechanic. Certain related and theoretical subjects are presented to broaden the training and experience of the individual beyond the minimum required for the license.

Airport service work is included. Instruction is given at the school hangar located on Williamsport's modern airport.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Aerodynamics	30 hours
Mechanical Drawing	30 hours
Aircraft Woodwork	90 hours
Aircraft Welding	180 hours
Aircraft Sheet Metal	240 hours
Electrical Systems	30 hours
Fuel Systems	30 hours
Hydraulic Systems	30 hours
Fabric, Covering, and Doping	240 hours
Rigging and Assembly	210 hours
Civil Air Regulations	30 hours
Airport Servicing	110 hours
Economics and Job Procurement	46 hours
Sketching	29 hours
Total	1325 hours

COURSE OUTLINE

Aerodynamics — **30 hours**

Nomenclature of the airplane. Elementary theory of flight. Airfoils and controls, their effect on flight. Aircraft stability and flight characteristics. Balance in aircraft, its effect on stability.

Mechanical Drawing — **30 hours**

The use and care of drawing instruments. Projection of simple drawings. Reading drawings and blueprints. Making drawings of structural repairs.

Aircraft Woodwork — **90 hours**

Kinds of wood used in aircraft, how they are identified. Inspection of wood used in aircraft structures, causes for rejection. Drying and storing wood. Steaming and bending wood. Plywood and its use in aircraft. Kinds of glue and their preparation. How to glue wood, procedures to be used, mixing precautions. Grain in wood, when acceptable, when to reject. Care and use of tools used in aircraft woodwork. Procedures to be followed in structural repairs. Splicing and gluing wood spars and ribs. Assembly, pressing, clamping, and drying time. Static testing glued joints. Stressed wood skin fuselage, wings, and control surfaces. Repairs permitted on wood structures, stressed skin covering. Construction, repair and replacement of wood spars and leading edge. Checking alignment in wood structures, methods used. Protective materials and their application.

Aircraft Welding — **180 hours**

Proper use and care of the welding equipment. Limitations for use of electric welding. Properties of metals. Identification of aircraft structural steel tubing. Selection of welding materials, type of flux to use, welding rods. Preparation of materials for welding. Acetylene welding procedure and practice. Identification of welding flames. Penetration and fusion of welds, appearance of satisfactory welds. Types of welded joints: fillets, butt, spot, rosette and angular welds. Types of splices: inset, sleeve, fishmouth, and angular. Inspection of welded joints: hot, cold, and burned welds. Cutting, filling, welding, fabricating structural tubing from drawings. Regulations pertaining to replacement of damaged steel tubing. Fabrication, assembly, and alignment of tubular structures. Warping—its cause and prevention. Brazing —materials limited to brazing, limitations in aircraft. Use of jigs, trammel points, levels, plumb bobs, and protractors. Protective materials and finishes, purpose, selection, and application.

Aircraft Sheet Metal — **240 hours**

Identification of sheet metals, steel, aluminum, aluminum alloys. Protective materials, selection and application, interior, exterior.

Aluminum alloys, strength, weight, use in aircraft. Heat treated sheet metals—their identification and use. Types of heat treatment, testing, Rockwell, Brinell. Hand tools and equipment used in fabrication of sheet metal, use and care. Cutting, forming, fitting, bending, fabricating stressed skin. Prohibited practice on aluminum alloys and steel. Limitations on repairs of aluminum alloy fittings. Precautions to be observed when attaching aluminum sheet to steel. Corrosion, its cause and prevention. Repair and replacement of stressed skin metal covering. Methods and procedures of attachment to structures. Identification of rivets, use of different types, regulations. Rivets: heat treated, storage, use, and care. Layout of sheet metal patterns. Cutting and fitting of sheets, bulkheads, etc. Drilling, burring, and filing cut edges and holes. Bend allowance, its importance in sheet metal. Forming aluminum, use of cornice brake, beading tools, shrinker, etc. A numbering system for rivets. Regulations on edge distance, spacing, head diameter, thickness. Hand riveting, types of rivet guns, sets, bucking bars. Installing rivets, brazier head, countersunk, flat head, blind. Riveting procedures, order of installing rivets. Inspection of acceptable rivets, causes for rejection. Temporary sheet fasteners, use, purpose, installation, tools used. Methods of drilling out defective rivets, precautions. Methods of dimpling, reasons for its use. Pneumatic riveting, types of rivet guns, set, bucking bars. Methods of countersinking, reasons. Cutting, forming, drilling, and aligning for riveting. Repairs and maintenance of fuel and oil tanks. Fire wall installation, acceptable materials. Repair and maintenance of cowling, fairings, regulations on repairs. Floats and hulls, construction, repair and maintenance. Cleaning aluminum, procedures, care and selection of materials.

Electrical Systems **30 hours**

Elementary theory of electricity. Wiring diagrams, importance, tracing. Wiring installations, bonding, conduits, materials used, precautions. Storage batteries, battery boxes, drains, acid proofing structures. Lights and flares, installation, repair and maintenance. Maintenance and inspection of electrical systems. Installation and adjustment of micro switches on landing gear, flaps. Circuit breakers, fuses, solenoids, voltage regulators. Generators and starters, installation and inspection. Charging storage batteries, re-charging with electrolyte, mixing. Installation and inspection of two-way radio equipment. Installation of antenna, adjusting the loading coil.

Fuel Systems **30 hours**

Aircraft fuels. Types of selector valves. Types of fuel pumps, engine driven, hand wobble pumps. Types of aircraft fuel systems, gravity and pressure feed. Pressure relief valves, installation and

adjustment. Fuel line installation, bending, attachment, size, and capacity. Types of fuel hose used in aircraft, clamps and sediment drains. Fuel tanks, installation, ventilation, draining, and inspection. Fuel gauges, tank caps, placarding for content. Auxiliary or reserve tank installations. Placarding fuel valve operation, take-off conditions, cruise. Regulations on size of tank per hp., size of lines for fuel flow.

Hydraulic Systems **30 hours**

Principles of hydraulics. Types of hydraulic fluids. Shock struts, types, installation, maintenance, and inspection. Oleo landing gear, types and servicing. Actuating cylinders and their adjustment. Types of hydraulic pumps. Types of hydraulic valves. Types of brake systems, vented type, sealed pressure type. Construction of master cylinders, wheel brake cylinders. Bleeding hydraulic systems. Pressure accumulators. Unloading valves. Types of selector valves. Trouble shooting on hydraulic systems, compliance with service bulletins.

Fabric, Covering, and Doping **240 hours**

Identification of materials used for fabric covering. Estimating materials required for covering wings, fuselage, controls. Cutting, fitting fabric for fuselage, wings, and control surfaces. Thread, cord, tapes, selection and application. Machine sewing, hand sewing, tacking, regulations. Hand rib stitching, types of approved knots, spacing requirements. Types of approved machine sewed seams. Inspection before covering. Location of inspection openings, number required. Selection and application of protective materials. Covering plywood with fabric, purpose, method used. How to set up spraying equipment, pressure tank, suction cup. Use and care of spraying equipment. Procedures for cleaning spray guns, hose, and containers. Adjustment of spray guns, proper size of air caps for dopes, enamels. Standard dope finishes, primers, dope proofing. Application of dope by hand brush, methods, purpose. Use of sandpaper, range of grits available, wet sand procedures. Laying out numbers, letters, masking procedures, regulations on size. Use of letter layout guides. Masking for stripes and trim colors. Mixing of pigmented dopes for spraying, pressure tank, suction cup. Methods of combating humid conditions, anti-blush reducers, retarder. Bleeding through finishes, causes, prevention. Rejuvenating—methods, purpose, procedures. Application of protective materials, corrosion proofing, Reglo. Rubbing compounds, use, purpose. Cleaners for fabric finishes, approved brands, precautions.

Rigging and Assembly **210 hours**

A numbering system for bolts, washers, nuts, cotter keys. Rigging procedures on monoplanes, methods, specifications. Rigging pro-

cedures on bi-planes, control systems, methods, specifications. Equipment, instruments and tools required for rigging, their use. Safety methods on turnbuckles, castle nuts, fittings. Corrections for faulty flight conditions, wing heaviness, tail heaviness. Trim tabs—their effect on flight, installation and inspection. How to level an airplane, leveling means, specifications. Weighing the plane, adjusting the scales to zero conditions. Weight and balance computations, importance. Installation and removal of items of equipment, weight and balance. Empty weight center of gravity, where located, reference means. Forward and rearward loading conditions, computations. Installation and removal of items of equipment from limits affected. Installation of plexiglas windshields, cutting and fitting, precautions. Installing and fitting farings, procedures. Types of instruments, installation, reading corrections, placarding. Marking instruments for limits of operation, purpose. Installation of gyro instruments, venturis, suction guages. Testing of engines and flight instruments with portable instrument test set. Installation of floats and skis, regulations pertaining to loads. Cabin heaters, installation, repair and inspection. Propeller maintenance, installation, tracking, servicing. Safety belt requirements, installation, testing, inspecting. Removal and installation of tires, wheels, bearings, servicing, inspection.

Federal Air Regulations **30 hours**

Requirements for a mechanic certificate. Types of inspections required on a commercial aircraft. F. A. A. forms required for inspections, log book entries. Certificates, registration, air worthiness, requirements. Renewal of air worthiness certificate, procedures, forms required. Regulations on major and minor repairs, forms required, drawings. Number of drawings required, why necessary. Mechanic responsibility on completion of forms 305, 309, 319, 337, 1130. Air worthiness directives, purpose, use by the mechanic. Aircraft specifications, purpose, use. Aviation Safety Release Bulletins, purpose. Types of manuals, 00, 01, 02, 03, 04, 14, 15, 18, 24, 52. Requirements for NC, NR, NX license.

Airport Servicing **110 hours**

Manner of conducting a thorough and detailed inspection. Fueling and servicing the airplane, precautions. Parking on the line, chocking wheels, tie down procedures. Clearing the windshield, materials used, precautions. Procedures for starting the engine, safety precautions. Hand cranking the propeller, precautions. Cleaning fabric covering, approved materials. Cleaning metal covering, approved materials. Pushing planes into hangars, proper handling, storage procedures. Parking on dollys, nosing planes, types permitted, precautions. Inflating tires, tools used. Greasing main and tail wheel bearings, types of grease recommended. Test-

ing and calibrating aircraft instruments with field test set. Adjusting magnetic compass, marking correction card. Cleaning the cockpit, upholstering, cleaning methods, materials used. Visual inspections. Compliance with service and mandatory notes. Maintenance of tools, buildings and equipment on the airport.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Sketching **29 hours**

Making free hand workable sketches to carry the message to the shop from field work or department to department.

* This course has been approved by the Department of Commerce, Federal Aeronautics Administration.

*POWERPLANT MECHANIC

A parallel course to Aviation Mechanic "A" License, but preparing for the Civil Aeronautics Authority examination for Powerplant Mechanic.

Certain related and theoretical subjects are presented to broaden the education and experience of the student beyond the minimum required for the license. Actual work experience is gained on "live" engines.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Powerplant Theory and Principles of Operation	140 hours
Shop Practice and Procedures, Use of Forms	30 hours
Mechanical Drawing	30 hours
Powerplant Design and Construction	30 hours
Carburetors and Fuel Injection Systems	90 hours
Supercharging Systems	30 hours
Ignition Systems	90 hours
Starting, Generating, and Regulating Systems	59 hours
Fuels and Fuel Systems	60 hours
Lubricants and Lubrication Systems	60 hours
Federal Air Regulations	30 hours
Inspection, Magnaflux and Dimensional Check	40 hours
Disassembly, Overhaul, Repair, and Assembly	200 hours
Powerplant Installation	30 hours

Operation and Trouble Shooting	90 hours
Powerplant Instruments	30 hours
Block Testing	60 hours
Powerplant Maintenance	90 hours
Propellers, Fixed, Controllable, Selective Pitch	90 hours
Mathematics	46 hours
Total	1325 hours

COURSE OUTLINE

Powerplant Theory and Principles of Operation — **140 hours**

History of engine development. Basic heat engines. Theory of operation of the four-stroke cycle engine. The engine and its parts, nomenclature, function and design feature. Diesel and two-stroke cycle phase of engine development. Heat energy conversion to useful power. Horsepower calculation, indicated, brake and friction H. P. Factors affecting engine performance. Transmission of power, gears, gear ratio, gear reduction. Theory of operation and fundamental principles of turbojet, turboprop, and compound engines. Aircraft weight and balance.

Shop Practice and Procedures, Use of Forms — **30 hours**

Bench and shop equipment, instruments and hand tools. Application of equipment and tools used in repair to aircraft and engines. General shop practice as found in the aviation field. Use of forms in repair procedures, cost estimates, records, parts, ordering, stocking, and general rules pertaining to the operation of an engine repair and overhaul shop.

Mechanical Drawing — **30 hours**

The use of drafting instruments. Projection of simple drawings. Interpretation of blueprints and drawings.

Powerplant Design and Construction — **30 hours**

Basic engine designs as to cylinder arrangement. Liquid and air-cooled types of engines. Cylinder construction and materials. Crankcase construction and materials. Piston assembly, construction and materials. Articulating rod assemblies, construction and materials. Accessory drivers, gears, construction, and materials.

Carburetors and Fuel Injection Systems — **90 hours**

Carburetion, theory, and principles. Float and injection carburetors; fuel injectors—their construction, operation, repair, maintenance, adjustment, and inspection. Effect on carburetor by variations in temperature, humidity. Induction systems, types, construction, operation, repair, and inspection. Carburetor trouble shooting—failures and corrective measures. Carburetor parts and accessories—nomenclature and purpose of each. F. A. A. regulations pertaining to carburetors and carburetion systems.

Supercharging Systems **30 hours**

Theory and principles of supercharging. Types of superchargers. Operation, construction and maintenance of internal stage supercharger. Operation, construction and maintenance of external stage supercharger. Function of inter-coolers. Supercharger controls, turbo-supercharger controls, hydraulic clutches. Supercharger gears and gear ratios. Nomenclature of supercharger units.

Ignition Systems **90 hours**

Theory of electricity. Theory of electricity as applied to ignition systems. Magneto ignition, high tension and low tension systems. Battery ignition. Types of magneto ignition systems, their construction, operation, installation, maintenance, repair, and inspection. Ignition systems, parts nomenclature. Boosters—types, purpose, installation, operation, and maintenance. Magneto overhaul, harness testing, care and maintenance. Ignition systems, timing and synchronization, shielding, and wiring. Spark plugs—types, hot and cold, high compression; adjustment, maintenance, repair, and inspection. Use of test equipment, voltmeters, ammeters, and ohmmeters.

Starting, Generating, and Regulating Systems **59 hours**

Starters—types, construction, installation, operation, repair, inspection. Overhaul of Eclipse direct drive starter. Solenoids and their operation and installation. Generators—types, purpose, operation, installation, maintenance, repair, and inspection. Overhaul of engine driven twelve volt generators. Generator bench testing. Regulating controls, three unit and two unit. Voltage regulators. Current limitators reverse current relays, operation, construction, care, and maintenance. Batteries—chemical operation, construction, installation, and maintenance. Fuses, installation and precautions to be followed in replacement.

Fuels and Fuel Systems **60 hours**

History of powerplant fuels. Types of fuels, octane rating, fuel specification tests, knock inhibitors. Commercial airline fuel specifications. Effect of fuels on engine performance. Basic fuel system design. Types of fuel systems. F. A. A. regulations pertaining to fuel systems. Fuel pumps, boost pumps, emergency pumps. Fuel transfer valves, dump valves, cross feed valves, selector valves. Fuel system tanks, repair and installation. Fuel system care and maintenance. Aircraft refueling.

Lubricants and Lubrication Systems **60 hours**

History and theory of lubrication. Development and refining of oils and lubricants, types, and grades. Oil specification tests, viscosity, pour point, flash point, etc. Lubrication systems, dry and wet sump, pressure and splash. Lubrication systems on radial

inverted inline, horizontally opposed. Trouble shooting on lubrication systems. Lines, hose connections, tanks, drains, vents, filters, their F. A. A. requirements and specifications. Heating and cooling, radiators, lagging, inspection, repair, and maintenance. Pressure relief valves—types, location, function, care, and maintenance. Manufacturer's specifications of oils and oil pressure. Pumps—types, installation, location, operation, and construction.

Federal Air Regulations **30 hours**

*Parts 01, 04, 13, 14, 15, 18, 24, and 52 appropriate to curriculum. Regulations pertaining to all powerplant repairs. Forms 319, 337, 309, etc. Procedures for submitting drawings for repair approval. Airworthiness Directives, purpose, type certificates. Inspection of engine, forms used, procedures. Log book entries, signatures, purpose.

Inspection, Magnaflux and Dimensional **40 hours**

Inspection procedures, charts and recording data. Theory of magnaflux inspection. Magnetic inspection of ferrous engine parts. Amperage specifications for engine parts. De-magnetizing. Zyglo method of inspection. Instruments and tools used for dimensional inspection. Engine specifications and table of limits.

Dissassembly, Overhaul, Repair, and Assembly **200 hours**

Engine dissassembly procedures on all shop engines, 40 to 400 hp. Description and study of parts. Nomenclature and function of parts. Valves and valve action. Crankshaft and connection rod study. Study of internal lubrication systems. Use of manufacturers overhaul manual. Overhaul procedures. Cylinder removal. Fitting valves and piston rings. Crankshaft and crankshaft overhaul. Valve mechanism overhaul. Cleaning methods and procedures. Bearings, oil seals. Engine assembly. Timing of valves. Timing of magnetos. Accessory installation. Methods of safetying. General repair methods of all engine repairs. Replacement of parts, proof of conformity, etc. F. A. A. regulations pertaining to engine repairs.

Powerplant Installation **30 hours**

Installation of radial, inline, and horizontally opposed engines. Installation of parts, shrouds, mounts, Lord mounts. Baffles and exhaust systems. Inspection of installation parts, assembly of installation parts. Installation and care of cowling. Types of engine controls, installation, operation, inspection, care, and maintenance. Fuel and oil line installation and inspection.

Operation and Trouble Shooting **90 hours**

Line service on airworthy engines. Run-up checks on light and medium aircraft, observing oil pressure, oil temperature, cylinder head temperature, fuel pressure, Magneto checks, r. p. m. drop on

single ignition. Propeller pitch change, operation. Trouble shooting by systematic elimination of troubles. Fuel system troubles. Ignition system troubles. Lack of compression—reasons and remedies. Lubrication system troubles, causes. Explanation of manufacturer's limitation. Cold weather starting, operation, and stoping procedures.

Powerplant Instruments **30 hours**

Engine instruments—operation, construction, care, and maintenance. Tachometers, pressure gauges, temperature gauges. Fuel-air ratio indicators, fuel quantity gauges. Aneroids, bourdon tubes, autosyn units, temperature units. Thermocouples and calibrated leads.

Block Testing **60 hours**

Engine run-in procedures. Installation of engine for running. Cooling problems in test running. Charts and forms used in testing. Fuel consumption tests. Oil consumption tests. Horsepower calculations, brake hp., friction hp., and indicated hp.

Powerplant Maintenance **90 hours**

Engine inspection procedures, daily check, 25-hour check; 50-hour and 100-hour inspection. Inspection forms 319 and log book entries. Oil change periods. Engine specifications and engine operation. Fuel system inspection, ignition system inspection, compression check. Lubrication system check. Inspection of exhaust system, heaters, and accessories. F. A. A. engine airworthiness notes. Propellers inspections, cowling inspection, controls. Engine tuneup, carburetion and ignition. Top overhauls, safetying of engine parts and fasteners.

Propellers **90 hours**

Blade element theory and nomenclature of propellers. Types, wood fixed pitch, adjustable, two position constant speed. Theory of electric and systems reverse thrust propellers and synchronization. R. p. m. and hp. ratings, limitations, specifications. Identication of propellers, markings, reasons, location, etc. Hydromatic and full feathering. Operation, maintenance, and servicing of propellers. Inspection, local etching and magnetic particle inspection (theory). Propeller static and dynamic balance. Maintenance and adjustment and operation of constant speed governor. Alterations and modifications, repairs and inspection regulations, as recommended by manufacturer, the extent of repair made and by whom. Equipment, tools and instruments necessary to properly adjust, service and make such repairs as are permissible, use, and care of this equipment. F. A. A. regulations and airworthiness notes on propellers. Regulations pertaining to the repairs on wooden propellers and causes for rejection. Regulations pertaining to

the repairs of metal hubs and blades. Tracking of propellers, purpose. Qualifications of the engine mechanic, responsibilities of the mechanic pertaining to propeller maintenance.

Mathematics **46 hours**

General math review, fractions, decimals, etc.

° This course has been approved by the F. A. A.

° Parts 3, 4a, 4b, 6, 8, 9, 43, and 62 appropriate to curriculum.

ACCOUNTANT

The accounting course stresses the preparation of well trained personnel who have mastered the principles of higher accounting and bookkeeping.

The course further aims at preparing office managers, auditors, and specialists in certain fields such as income tax, building and loan, and municipal accounting.

Business is demanding that the person for this type of work be capable and efficient, and that they show ability in all phases of accounting. The person with this background and initiative has little difficulty being placed and promoted with the leading firms of the country.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

General Business Training and Work Experience	440 hours
Business Mathematics and Mathematics of Finance	440 hours
Accounting I	240 hours
Accounting II	240 hours
Accounting III	150 hours
Cost Accounting	120 hours
Auditing	160 hours
Income Tax	120 hours
Office Management	100 hours
Typing	120 hours
Office Machines	120 hours
English and Correspondence	160 hours
Economics	120 hours
Business Law	120 hours
Total	2650 hours

COURSE OUTLINE

General Business Training and Work Experience **440 hours**

An acquaintance with business terms, business forms, organizations of business, filing, economics, and economic problems. A practical application of work learned in local business or school related, of course, to specific objectives of students as well as the procedure of job procurement.

Business Mathematics and Mathematics of Finance **440 hours**

Fundamental operations, fractions, decimals, percentage and all of the uses of percentage. Payroll, collecting and tabulating materials, graphs, interpretation of statistical data. The intricate workings of interest, insurance, depreciation and amortization, and discounting notes.

Accounting I **240 hours**

The elements of accounting, the procedures, terminology, theories, and practical application of proprietorship and partnership accounting including laboratory experiences and practices.

Accounting II **240 hours**

The further study of the above with corporate organizations, their records, statements and practical problems along with the more advanced study of the three business organizations—proprietorship, partnership, and corporations. The theory and laboratory exercises are included.

Accounting III **150 hours**

This course will include the different accounting systems, dealing with special accounting problems in the various forms of business, manufacturing accounting, departmental accounting, accounting for branch operations, and laboratory exercises included in this course.

Cost Accounting **120 hours**

Transactions of manufacturer; finding unit costs, total cost after processing, and profit through distribution.

Auditing **160 hours**

Techniques and procedure of conducting an audit, work sheets, and corrections. Principles and concepts, determining, analyzing, and classifications of gross income.

Income Tax **120 hours**

Deductions, credits, exemptions, rates, and computation of all types of tax.

Office Management 100 hours

Personal efficiency, developing executive ability, office procedures, filing, mailing, reference books, sources of information, and personnel problems and management.

Typing 120 hours

Fundamentals of touch typing, mechanical parts, speed and accuracy, business statements, as well as advanced letter writing.

Office Machines 120 hours

The operation of the various business machines: Ten-key adding listing, full key board, key driven and rotary calculator, bookkeeping machine, mimeograph and spirit duplication.

English and Correspondence 160 hours

Fundamentals of letter writing, employment process, punctuation, oral and written English, reports, spelling, and general business English. Proof reading and a study of "House Publication."

Economics 120 hours

The study of the economic principles, the law of supply and demand, pricing, cost, etc., as applied to business and our system of free enterprise. Terms, reading of graphs, interpretation of charts and reports, and the relationship of economics to our democratic form of government.

Business Law 120 hours

Legal rights and obligations arising out of common business, responsibility of agent and principal, negotiable instruments, partnership, bailment, sales, contracts, and real and personal property.

BUSINESS MANAGEMENT

The business management course emphasizes the preparation of students interested in the fields of manufacturing, utilities, selling, and finance.

This type of person should be able to assume the leadership type of position such as office supervisor, office manager, or departmental manager.

Since a broad area of business is covered and a thorough knowledge is expected, those persons will have many opportunities to advance in their chosen vocation.

COURSE OUTLINE

Length of Course ..... 2650 hours
Duration of Course ..... 2 years

COURSE UNITS

General Business and Work Experience	330 hours
Mathematics and Statistics	440 hours
Accounting I	160 hours
Accounting II	160 hours
Cost Accounting	120 hours
Business Law	160 hours
Office Management	200 hours
Banking, Insurance, and Investment	360 hours
Marketing and Merchandising	160 hours
Typing	120 hours
Business Machines	80 hours
English and Correspondence	200 hours
Theory of Office Automation	40 hours
Economics	120 hours
Total	2650 hours

COURSE OUTLINE

General Business and Work Experience **330 hours**

An acquaintance with business terms, business forms, organization of business, filing, and economic problems. A practical application of work learned in local business or school, related of course, to specific objective of student. Also, the procedure on job procurement.

Mathematics and Statistics **440 hours**

Fundamental operation, fractions, decimals, percentage and all of its uses. Payroll, collecting and tabulating of statistics, determining average, median mode, and standard deviation. Graphs and forecasts, and interpretation of statistical data.

Accounting I **160 hours**

The elements of accounting, the procedures, terminology, theories, and practical application of proprietorship and partnership accounting including laboratory experiences and practices.

Accounting II **160 hours**

The further study of the above with corporate organizations, their records, statements and practical problems along with more advanced study of the three business organizations—proprietorship, partnership, and corporation. The theory and laboratory exercises are included.

Cost Accounting **120 hours**

Transactions of manufacturer; finding unit costs, total costs after processing, and profit through distribution.

Business Law 160 hours

Legal rights and obligations arising out of common business, responsibility of agent and principal, negotiable instruments, partnership, bailment, sales, and real and personal property.

Office Management 200 hours

Personal efficiency, developing executive ability, office procedures, filing, mailing, reference books, sources of information, and personnel problems and management.

Banking, Insurance, and Investment 360 hours

Banking: study of money and banking, organization credits and their analysis, loans and discounts. Collection, clearings, examinations, and regulations. Insurance: analysis, valuation, adjustment. Various kinds of insurance. Probability of life, calculations of mortality tables and policy reserves. Investment: study of stock market and other forms of investment (bonds, real estate, business, and others) reports, trade terms. Difference between speculation and investment.

Marketing and Merchandising 160 hours

An analysis of modern methods of selling, the marketing of goods, effect of marketing on consumer and producer. Place of the middleman. Rules for selling. The effect of volume and other factors on profit.

Typing 120 hours

Fundamentals of touch typing, mechanical parts, speed and accuracy, business letters, forms, outlines, legal papers, tabulating, and the doing of business statements on the typewriter, also advanced letter writing.

Business Machines 80 hours

The operation of the various business machines: the adding-listing, ten-key adding, full keyboard, key-driven, and rotary calculators, bookkeeping machines, mineograph and spirit duplicators.

English 200 hours

Fundamentals of letter writing, employment process, punctuation, oral and written English, reports, spelling, and general business English. Proof reading and a study of "House Publication."

Theory of Office Automation 40 hours

This course will include a study of IBM and Remington Rand types of equipment for automation. Several field trips to installations in Williamsport will be included. The clerical operations necessary for the complete operation of Remington Rand key punch machines. Some general tabulating work will also be done in this course.

Economics **120 hours**

The study of the economic principles, the law of supply and demand, pricing, cost, etc., applied to business and our system of free enterprise. Terms, reading of graphs, interpretation of charts and reports, and the relationship of economics to our democratic form of government.

*BUSINESS ADMINISTRATION

The specific objective of this course is to train young men and women in the junior executive field of endeavor. After a sufficient general background is acquired and the business management course is satisfactorily completed, students selecting this course will engage in those skills which are needed in management.

Thus, these persons will become useful, productive and contributing citizens in the economic world of work.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

English and Its Application, Report Writing	175 hours
Industrial History and Commercial Geography	175 hours
Economics and Economic Problems	150 hours
General Science	175 hours
Advanced Merchandising	100 hours
Advanced Accounting, Auditing, and Income Tax	200 hours
Psychology and Sociology	100 hours
Office Practice and Work Experience	200 hours
Theory of Automation	50 hours
Total	1325 hours

COURSE OUTLINE

English and Its Application, Report Writing **175 hours**

Fundamentals of letter writing, employment process, oral and written reports, spelling and grammar. Fundamental concepts of reports, kinds, purpose, and organizing these data and actual writing reports from accounting viewpoint.

Industrial History and Commercial Geography **175 hours**

History of commerce, labor and various reforms, with a tie into today's affairs, why the world does what it does, the barriers of

nature which influence business and industry, a better understanding of using one's own locality to a better advantage.

Economics and Economic Problems **150 hours**

A study of the law of supply and demand, the study of its effect on various economic factors, and what these factors are; what problems are created by economics and how to solve these problems.

General Science **175 hours**

A study of the natural phenomena and how they effect us, how we can use energy in business, what safety precautions can be had in business, laws of growth and the effect on people; diet and proper body care, basic theory of electronics.

Psychology and Sociology **100 hours**

Psychology will include the study of tendencies of people and the laws of reaction of these people. A great deal of stress will be given on "How to get along well with others." There will be a definite instruction on personality development. Sociology will include the study of the functions of the various social institutions with special emphasis upon how these influence people and what can be done to help build a better society.

Advanced Merchandising **100 hours**

Practical application of theory of marketing and merchandising. The unit will also include tours to various kinds of businesses with appropriate reports as to sales methods which apply to these firms. Visual aids and sales training will also be a part of this course.

Office Practice and Work Experience **200 hours**

This course will include working with and typing regular business, as well as executive papers. Actual office work in school or in business offices will constitute the work experience part of this unit.

Advanced Accounting, Auditing, and Income Tax **200 hours**

Advanced accounting for all phases of ownership in business. In addition, the following will be included: examination, preparation, and analysis of statements, various journals and various systems, comparative statements, charts, and statistics. Auditing will include: discovering of points to check each kind of classification item found in a business, short and long forms of reports and when to use each, application of theory to actual case studies. Income tax will cover the current tax laws, new interpretations, and the filling out of returns involving all problems which one should know for individual tax returns.

° Prerequisite—Business Management.

Theory of Office Machine Automation **50 hours**

This course will include a study of IBM and Remington Rand types of equipment for automation. Several field trips to installations in the area will be included. The clerical operations necessary for the complete operation of automation will be gone into. Actual operation of Remington Rand Key Punch machine. Some general tabulating work will also be done in this course.

BUSINESS MACHINES OPERATOR

This course aims to train persons to be competent business and office machine operators and to prepare them for general clerical work. Since almost all offices have need of this type of worker, job opportunities are good. The student first becomes acquainted with the operating principles of the various machines and then trains to gain speed and accuracy.

A knowledge of other business skills is vital to success in this field of work as the duties of these operators vary according to offices. Therefore, a basic knowledge of related business skills are included in this course.

COURSE OUTLINE

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Business Machines	480 hours
General Clerical Procedures	165 hours
Typing	140 hours
Filing	20 hours
Business Mathematics	120 hours
Business Law	40 hours
Economics	40 hours
English	120 hours
Accounting I	120 hours
Marketing and Merchandising	80 hours
Total	1325 hours

COURSE OUTLINE

Business Machines — 480 hours

Duplicating machines, calculating machines, graphotype, addressograph, electric typewriter, and other machines which time will permit will be given in this course.

General Clerical Procedures — 165 hours

Terms, forms, office techniques for handling mail, telephone manners, handling details, developing personality, and the principles of job procurement.

Typing — 140 hours

Fundamentals of touch typing, mechancial parts, speed, accuracy, business letters, forms, outlines, tabulating, reports, and other business forms which are typed.

Filing — 20 hours

Principles of alphabetical, numerical, geographical, and subject filing will be mastered. Visible index, cross reference, and terms peculiar to filing.

Business Mathematics — 120 hours

Review of fundamental operations, fractions, decimals, speed and accuracy drills, percentage drills, and application of percentage.

Business Law — 40 hours

Legal rights and obligations arising out of common business, real and personal property, responsibilities of agent and principal, negotiable instruments, partnerships, bailments, and sale contracts.

Economics — 40 hours

The study of the economic principles, the law of supply and demand, pricing, cost, etc., as applied to business and our system of free enterprise. Terms, reading of graphs, interpretations of charts and reports, and the relationship of economics to our democratic form of government.

English — 120 hours

Fundamentals of letter writing, grammar, punctuation, oral and written English and spelling.

Accounting I — 120 hours

The elements of accounting, procedures, terminology, theories and practical application as it applies to the single proprietorship and partnership, also, the operation of business machines to accounting.

Marketing and Merchandising — 80 hours

An analysis of modern methods of selling, the marketing of goods. Effect of marketing on consumer and producer. Place of the middleman. Rules for selling. The effect of volume and other factors on profit.

CLERK-TYPIST AND RECEPTIONIST

This course is aimed at training efficient receptionists as well as capable clerk-typists. The two positions are combined in many offices, but there are numerous opportunities for each separately.

Clerical workers are employed in all industries since some office work is essential in nearly every business. This training is given in all the basic skills necessary to qualify for this field.

Length of Course ..... **660 hours**
Duration of Course ..... **6 months**

COURSE UNITS

Switchboard Operation and Techniques	10 hours
Business Machines	120 hours
Office Practice	90 hours
Typing	240 hours
Business Mathematics	40 hours
Filing	20 hours
English	100 hours
Accounting I	40 hours
Total	660 hours

COURSE OUTLINE

Switchboard Operation and Techniques **10 hours**

Study and observation of procedures of PBX equipment, telephone manners, and the service to be rendered to the firm and to the general public.

Business Machines **120 hours**

Duplicating machines, calculating machines, graphotype, addressograph, electric typewriter, and other machines which time will permit will be given in this course.

Office Practice **90 hours**

A knowledge of business practices such as: handling of mail, transportation, telephone technique, use of directories and credit books, general clerical work; planning of work; following instructions; developing initiative and study of office economics and job procurement.

Typing **240 hours**

Fundamentals of touch typing, mechanical parts, speed, accuracy,

business letters, forms, outlines, tabulating, reports, and other business forms which should be typed.

Business Mathematics **40 hours**

Review of fundamental operations, fractions, decimals, speed and accuracy drills, percentage drills, and application of percentage.

Filing **20 hours**

Principles of alphabetical, numerical, geographical, and subject filing will be mastered. Visible index, cross reference and terms peculiar to filing.

English **100 hours**

Fundamentals of letter writing, grammar, punctuation, oral and written English and spelling.

Accounting I **40 hours**

The elements of accounting, procedures, terminology, theoretic and practical application as it applies to the single proprietorship.

SECRETARY

Trained secretaries, both male and female, are in great demand today. Business needs competent persons to take care of the work load which falls to busy executives.

The secretarial training course aims at achievement of a mastery of fundamental office practices, as well as the specific knowledge and skills which are involved in successful secretarial work. The course also aims at the acquiring of proper work attitudes, a sense of responsibility, and the ability to follow directions.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Office Practice	220 hours
Filing	20 hours
Typewriting	265 hours
Shorthand and Transcription	480 hours
Business Mathematics	80 hours
Accounting I	40 hours
English	180 hours
Business Law	40 hours
Total	1325 hours

COURSE OUTLINE

Office Practice **220 hours**

The use of and operation of business machines and dictating equipment; knowledge of business practices such as: handling of mail, transportation, telephone techniques, use of directories and credit books, and duties of a receptionist; secretarial techniques; general clerical work; planning of work; following instructions; developing initiative; job procurement; and business economics.

Filing **20 hours**

Principles of alphabetical, numerical, geographical, and subject filing will be mastered. Visible index, cross reference, and terms peculiar to filing.

Typewriting **265 hours**

Fundamentals of the machine, touch typing principles, care of the machine, typing exercises and projects which lead to skill and accuracy, and the preparation of stencils and mats.

Shorthand and Transcription **480 hours**

Introduction to symbols, symbol combinations, practice exercises and dictation, dictation transcription.

Business Mathematics **80 hours**

Fundamentals, fractions, decimals, percentages, and miscellaneous exercises dealing with various office projects, payroll, elementary principles of bookkeeping.

Accounting I **40 hours**

The elements of accounting, procedure, terminology, theories and practical application as it applies to the single proprietorship.

English **180 hours**

Sentence structure, rules of punctuation and capitalization, business letter writing, reports and statistical data, and spelling.

Business Law **40 hours**

Legal instruments, such as: contracts, deeds, leases, mortgages; credit instruments, such as: drafts, notes, acceptances, bills of lading, and bank transactions.

CARPENTRY AND BUILDING CONSTRUCTION

The carpentry and building construction course provides training in the fundamental skills and knowledge basic to the trade. Instruction is given in carpentry and masonry,

on laying out, erecting, and finishing of building in the light construction field. Carpentry and masonry work done in connection with remodeling and repairing is covered also. This course is for students who desire to become carpenters or masons.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Hand Tools	250 hours
Building Materials	50 hours
Power Tools	50 hours
House Framing	300 hours
Interior Finish	200 hours
Exterior Finish	146 hours
Construction Experience	600 hours
Blueprint Reading	46 hours
Estimating	46 hours
Theory	200 hours
Mathematics	46 hours
Economics and Job Procurement	46 hours
Block Construction	170 hours
Brick Construction	250 hours
Concrete Construction	100 hours
Surveying	100 hours
Foundation	50 hours
Total	2650 hours

COURSE OUTLINE

Hand Tools **250 hours**

The use and care of hand tools used for marking, measuring, guiding, and testing, sawing, cutting, planing, boring, and fastening materials. Filing and sharpening tools.

Building Materials **50 hours**

Identification, selection, and use of lumber and building supplies such as framing materials, scaffold materials, exterior and interior finish and millwork, floor and wall coverings, hardware, etc.

Power Tools **50 hours**

Use and care of portable electric saws, drills, sanders, routers, planes, and saber saws, as well as the basic woodworking machines used by the carpenter.

House Framing — **300 hours**

Framing and erecting columns, girders, floors, sidewalls, partitions, roof framing as required in home construction. Aligning and bracing the building frame. Framing openings in floors and walls. Porch framing. Building simple stairs. Application of wood and insulation sheathing.

Interior Finish — **200 hours**

Installing base, moldings, door and window trim, fitting and hanging doors and installing windows. Building mantels, closets, cabinets, and built-in features. Installing plaster grounds and lath. Installing wall board and other dry wall construction materials. Laying finish flooring and floor tile. Installing building hardware and factory-built cabinets and millwork. Stairbuilding.

Exterior Finish — **146 hours**

Cornice work, watertables, belt courses, window and door frames, porch trim, siding, roofing, etc.

Construction Experience — **600 hours**

Students showing satisfactory progress and ability will be provided with actual construction experience, both in the shop and on outside projects.

Blueprint Reading — **46 hours**

Principles of architectural drawings. Reading and interpreting floor plans, elevations, sections, and details.

Estimating — **46 hours**

Figuring quantities of materials. Types of estimates. Estimating the cost of labor and materials. Keeping cost records.

Theory — **200 hours**

Shop theory is distributed throughout the entire course. It includes history of the building trades, trade terms, principles and theory of building construction, etc.

Mathematics — **46 hours**

General math review: fractions, decimals, percentage, ratio, and proportion square root. Rule of right triangle, angles, areas, and volumes.

Economics and Job Procurement — **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Block Construction — **170 hours**

Exercises in laying building block, various patterns, types encountered in masonry buildings.

Bricklaying 250 hours

The development of skills necessary in the construction of fireplaces, chimneys, walls, etc., encountered in the light construction industry.

Concrete Construction 100 hours

Principles of concrete design. Concrete foundation walls and footers. Proportions of ingredients. Reinforced concrete. Concrete finishing, curing, and testing.

Surveying 100 hours

Principles of surveying. Staking out the building. Laying out excavation and building lines. Using the level and transit.

Foundation 50 hours

Excavation, shoring, soil conditions, various types of footers. Foundation loads.

ARCHITECTURAL DRAFTSMAN

This course prepares the student to be a draftsman for architectural offices. It provides training in accepted drafting practices, and in making the drawings and calculations necessary for the design and construction of all types of buildings. The course units listed for this course indicate the extent to which the student is made ready to deal with the responsibilities he will face in such a position.

Length of Course 3300 hours
Duration of Course 2½ years

COURSE UNITS

Mathematics 101	46 hours
Physics	46 hours
Technical Communications	46 hours
Economics and Job Procurement	46 hours
Basic Drafting	250 hours
Measured Drawings	25 hours
Design Studies	100 hours
Estimating	25 hours
Preliminary Drawings	100 hours
Perspective Rendering	200 hours
Static Mechanics	100 hours
Timber Construction	50 hours
Steel Construction	50 hours

Concrete Construction	50 hours
Roof Trusses	50 hours
Detailing Masonry	100 hours
Detailing Metals	100 hours
Detailing Wood	100 hours
Working Drawings, General Construction	1000 hours
Working Drawings, Mechanical	300 hours
Working Drawings, Electrical	100 hours
Specifications	75 hours
Job Supervision	41 hours
Related Instruction	300 hours
Total	3300 hours

COURSE OUTLINE

Mathematics 101 **46 hours**

Elementary algebra, fundamentals, factoring, simple equations and fractions.

Physics **46 hours**

Matter, force, motion and work energy.

Technical Communications **46 hours**

Basic English review, English composition, oral expression, vocabuary improvement, letters of application, note taking, and technical report writing.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Basic Drafting **250 hours**

Use of instruments, geometric construction, lettering, orthographic profection, sectioning, auxiliary views, revolutions, dimensions, welding drawings, map drafting, ink tracing, and Leroy lettering.

Measured Drawings **25 hours**

Technique of surveying existing sites and buildings for measurements and data; making of sketches and accurate drawings to scale.

Design Studies **100 hours**

Principles of architectural planning, design, analysis and synthesis. Free hand sketching of student's own designs for a residential building and a commercial or institutional building.

Estimating **25 hours**

Quantity survey and cost analysis; calculations of construction cost by square foot and cubic foot methods.

Preliminary Drawings 100 hours

Student's designs of the above projects are presented in a manner typical of standard office procedure for preliminary work.

Perspective Rendering 200 hours

Principles and techniques of projected two-point visual ray perspective; rendering in pencil, colored pencil, pen and ink, and water color. Emphasis is placed on presentation for reproduction.

Static Mechanics 100 hours

Direct stresses, deformation, moments, reactions on beams, shear and bending moments and diagrams, theory of bending and properties of sections taught from Parker's "Simplified Engineering for Architects and Builders." This is the foundation for the following structural studies:

Timber Construction 50 hours

Design of timber beams, columns and floors; laminated wood sections; typical applications incorporated into design projects.

Steel Construction 50 hours

Techniques of designing and developing structural steel frame buildings. Visit to fabricating shops and buildings under construction augment this study. Application in commercial or institutional design projects.

Concrete Construction 50 hours

Design of reinforced concrete footings, columns, beams, joists and slabs. Application in design projects.

Roof Trusses 50 hours

Stress diagrams for typical trusses; design of timber and steel members. Application in design projects.

Detailing Masonry 100 hours

Principles and practice in detailing and shop drafting for all forms of architectural masonry work including: cut and cast stone, ceramic tile, structural clay products, poured-in-place materials such as terrazzo, gypsum and plasters, etc.

Detailing Metals 100 hours

Principles and practice in detailing and shop drafting for all forms of architectural metal work including: structural steel, stairwork, thresholds, windows, doors, flashings, facings, expansion joints, louvres and skylights, etc.

Detailing Wood 100 hours

Principles and practice in detailing and shop drafting for all forms of architectural wood work including: windows, doors, cabinet work, shelving, stairwork, and millwork, etc.

Working Drawings—General Construction **1000 hours**

Student prepares at least three complete sets of working drawings during the course: one in frame construction as an introductory exercise, one in masonry for the residence he designed and one in steel frame, concrete, masonry and curtain wall for the commercial building he designed. These include all phases of work as follows: plot plans, contour revision, utilities, floor plans, elevations, wall sections, cross sections, interior elevations, small scale and large scale details, schedules (room finish, door, window, equipment, loading, beam, column and lintel), material indications, legends, drawings, indexes and title sheets.

Working Drawings—Mechanical **300 hours**

Principles of plumbing systems, sewage disposal, septic tanks, leeching fields. Application to student's design. Calculation of heat loss, design of heating systems. Presentation of all of this according to standard engineering procedure.

Working Drawings—Electrical **100 hours**

Principles of laying out electric wiring systems, switching, circuiting, diagraming of service entrance, panel boards and fixture schedules. All this presented in standard engineering procedure.

Specifications and Contracts **75 hours**

Bidding procedures and documents, general conditions, special conditions, specifications sheets, stipulation against liens, agreements and other legal documents, relationship of drawings to specifications, preparation of change orders and certificates of payment.

Job Supervision **41 hours**

Duties of the clerk of the works and the architect's superintendent, conducting job conferences, writing of daily and weekly reports.

Related Instruction **300 hours**

Field trips to architect's offices, buildings under construction, plants where building materials are manufactured, study of shop drawings, available handbooks and magazines, Sweets Catalogs, Architectural Graphic Standards, as well as plans and specifications of practicing architects. Motion pictures pertinent to course of study are shown once a week. When student's knowledge of basic mathematics is deficient, special study is arranged to prepare him for the course in elementary algebra.

MECHANICAL DRAFTSMAN

The mechanical draftsman is responsible for the making of detail drawings for the purpose of conveying engineering ideas to the shop.

The purpose of this course is to provide a broad and thorough knowledge of mechanical drafting and is designed to parallel industrial drafting as closely as possible, thus making the transition from school to industry easy.

A graduate can qualify as a senior draftsman or junior designer and is prepared for a variety of industrial and manufacturing establishments. For greatest success a high school education or the equivalent with an aptitude for mathematics and science is necessary. With experience and continued study, graduates may rise to very responsible positions.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Basic Drafting	540 hours
Drafting Techniques	260 hours
Mechanisms	200 hours
Advanced Practice Drawing	410 hours
Product Development	200 hours
Drafting Standards	100 hours
Machine Shop	120 hours
Pattern Shop	120 hours
Sheet Metal Shop	120 hours
Mathematics	184 hours
Physics	92 hours
Chemistry	46 hours
Technical Communications	92 hours
Economics and Job Procurement	46 hours
Shop Theory	120 hours
Total	2650 hours

COURSE OUTLINE

Basic Drafting **540 hours**

Use of instruments; geometric construction; lettering; orthographic projection; sectioning; auxiliary views, revolutions; dimensioning (emphasized throughout entire course); bolts, screws, and other fastenings; working drawings; assembly and detail drawings; pictorial drawings; sheet metal development; intersections; transitions and triangulation; basic drafting theory and shop process theory.

Drafting Techniques **260 hours**

Detailing from castings involving limits, fits, tolerances and finishes; theory.

Mechanisms **200 hours**

Gear drawings and calculations; cam drawings and calculations; other mechanisms; theory.

Advanced Practice Drawing **410 hours**

Detailing from engineering layouts; drawing of weldments; redesign of castings to weldments; electrical and electronic drawings; piping drawing; theory.

Product Development **200 hours**

Product layout and design; product drawings; parts lists; bills of materials; engineering procedure and drawing specifications; theory.

Drawing Standards **100 hours**

Drawing to company standards; ink tracing; theory.

Machine Shop **120 hours**

Actual shop work; basic machine operations; production of small parts; theory.

Pattern Shop **120 hours**

Actual shop work; use of machines; production of simple patterns; foundry practice; theory.

Sheet Metal Shop **120 hours**

Actual shop work; use of machines; production of sheet metal objects; theory.

Mathematics **184 hours**

Math review; elementary algebra, advanced algebra; trigonometry; logarithms; slide rule.

Physics **92 hours**

Matter; force and motion; work, energy, and power; machines and heat.

Chemistry **46 hours**

Beginning chemistry; chemistry of metals.

Technical Communications **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

Economics and Job Procurement 46 hours

American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Shop Theory 120 hours

Basic drafting theory; advanced drafting theory; related shop theory; related films.

LAYOUT FABRICATOR TECHNICIAN

The layout fabricator technicians' duties consist of calculating bend allowances; making accurate full-size markings on heavy plate and pipe; cutting with an acetylene torch; setting up, squaring, and aligning the parts to be fabricated, and tack welding them in position in preparation for finish welding, all according to plans presented in blueprint form.

The purpose of this course is to provide as broad a knowledge of drafting and blueprint reading, sheet metal layout, and welding as is possible so that graduates can find employment in the heavy metalworking industries.

Graduates of this course can qualify as an assistant layoutman and fabricator in most industries and advance to journeyman class. Since job classifications vary with different industries, a graduate may also qualify in any one of the following: layoutman, cutter, setup fabricator, or welder.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Mechanical and Pipe Drafting (860 hours)	
Basic Drafting	400 hours
Applied Drafting	100 hours
Geometry of Drawing	160 hours
Pipe Drafting	200 hours
Sheet Metal Layout and Fabrication (642 hours)	
Fundamental Operations	140 hours
Machine Operations	120 hours
Layout (Parallel Development)	60 hours
Layout (Radial Development)	60 hours
Layout (Triangulation)	60 hours
Layout (Triangulation—Simplified)	60 hours

Special Problems	142 hours
Welding (642 hours)	
Electric Welding	248 hours
Fabrication and Welding of Pipe Joints	200 hours
Acetylene Sheet Metal Welding	55 hours
Acetylene Hand Cutting of Steel Plate and Pipe	24 hours
Acetylene Welding of Small Diameter Pipe	55 hours
Silver Soldering	6 hours
Brazing of Steel, Copper, etc.	30 hours
Welding Theory on all Phases Covered	24 hours
Mathematics	184 hours
Physics	184 hours
Technical Communications	92 hours
Economics and Job Procurement	46 hours

COURSE OUTLINE

Mechanical and Pipe Drafting

Basic Drafting — **400 hours**

Use of instruments; geometric construction; lettering; orthographic projections; sectioning; auxiliary projection; revolutions; basic dimensioning; bolts, screws, and other fastenings; pictorial drawing.

Applied Drafting — **100 hours**

Working drawings; detail drawing from assemblies; assembly drawings from details.

Geometry of Drawing — **160 hours**

Point projection; line projection; surface projection; piercing points; lines of intersection.

Pipe Drafting — **200 hours**

Pipe tables and pipe symbols; elementary pipe drawing including orthographics, isometric, and symbolic drawings. Specialized pipe drafting including blueprint reading and pipe detailing from pipe layouts.

Sheet Metal Layout and Fabrication

Fundamental Operations — **140 hours**

Hand tools involving marking, cutting, forming, bending, filing, soldering, grooving, chisels, dovetailing, flanging, punching, drilling, hacksawing, riveting, wiring, seaming.

Machine Operations — **120 hours**

Bar folder, cornice brake, slip roll square shear, bending, crimping, ring, and circular shears, turning, burring, grinding.

Layout (Parallel Development) — **60 hours**

Round pipe, elbows, pipe and roof flange, tee's, "Y" joints, irregular intersections.

Layout (Radial Development) — 60 hours

Cones, pyramids, frustrums, conical gutter outlet, ventilator head, funnel, cone intersected by vertical pipe.

Layout (Triangulation) — 60 hours

Transition; square to square, square to round, rectangular to round, round to round, twisted square or rectangular, roof collar, square to round.

Layout (Triangulation—simplified) — 60 hours

Roof collars; irregular flaring and round top, square bottom, three-piece elbow, irregular two branch fitting, irregular "T" joint.

Special Problems — 142 hours

Round ventilator, base for chimney top, chimney hood, range hood sink, transition elbow.

Welding

Electric Welding — 248 hours

Steel and alloy steel plate and pipe in all positions with different type and sizes of electrodes.

Fabrication and Welding of Pipe Joints — 200 hours

Acetylene Sheet Metal Welding — 55 hours

Acetylene Hand Cutting of Steel Plate and Pipe — 24 hours

Acetylene Welding of Small Diameter Pipe — 55 hours

Silver Soldering — 6 hours

Brazing of Steel, Copper, etc. — 30 hours

Welding Theory on All Phases Covered — 24 hours

Mathematics — 184 hours

Basis math, elementary algebra, shop trigonometry, and blueprint problems.

Physics — 184 hours

Matter, force and motion; work energy and power; machine; heat.

Technical Communications — 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, technical report writing.

Economics and Job Procurement — 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

TECHNICAL ILLUSTRATION I

This course is designed to prepare students in the field of technical illustration. This involves the interpretation of engineering drawings into illustrations for the general purpose of clarifying difficult subject, whether technical or otherwise, by pictorial representation.

Illustrations are used for proposal drawings and technical publications such as: instruction and service manuals, textbooks, parts catalogs, sales literature, etc.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Drafting	750 hours
Perspective	350 hours
Axonometric	324 hours
Illustration Techniques	500 hours
General Illustration Practice	300 hours
Mathematics	46 hours
Physics	92 hours
Technical Communications	92 hours
Economics and Job Procurement	46 hours
Basic Lithography	30 hours
Airbrush	120 hours
Total	2650 hours

COURSE OUTLINE

Drafting **750 hours**

Instruction is given in basic drafting, sectional views, auxiliary views, revolutions, dimensioning, working drawings, developments, intersections, assembly and detail drawings, gears, cams, and castings.

Perspective **350 hours**

Instruction is given in one-point or parallel perspective, two-point or angular perspective, and three-point perspective. The projection method and the measuring plan method are emphasized.

Axonometric Projections **324 hours**

Instruction is given in isometric, dimetric and trimetric projections along with instruction in the use of some of the more popular industrial drawing aids. A unique method for the student to construct his own projection plan is included.

Illustration Techniques 500 hours

Outline drawings; instruction is given in the use of pencil and pen in making outline drawings. Pencil shading: instruction is given in the method of shading to indicate the texture of various materials also, the manner in which shadows and reflected light appear on the various surfaces. Pen and ink shading: instruction is given in the technique of using lines and stippling to add shape to the surface of the object represented pictorially. Commercial shading sheets: instruction is given in the use of "craft-tint" and in the use of "Zip-a-tone" shading sheets.

General Illustration Practice 300 hours

This phase of the course is devoted to giving the student an opportunity to produce illustrations which will meet employment requirements. These illustrations include assembly, exploded, and cut-away views of mechanical objects. Instruction in the use of mechanical lettering devices along with the methods employed in making overlays and parts identification.

Mathematics 46 hours

Algebra (thru quadratics), logarithms, slide rule, trigonometry, and strength of materials.

Physics 92 hours

Matter, force and motion; work, energy and power; machines and heat.

Technical Communications 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, technical report writing.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Basic Lithography 30 hours

Theory and observation of graphic arts production processes.

Airbrush 120 hours

Airbrush instruction is given in this course so that the student has some knowledge of the airbrush. It includes cleaning, care, maintenance, adjusting and the basic exercises.

*TECHNICAL ILLUSTRATION II

Technical Illustration II trains qualified students to prepare complicated drawings and renderings in black and white, in color and many of the different mediums and techniques both in line and continuous tone. The drawings are of technical and mechanical subjects and meet government publication standards.

The student is equipped to prepare drawings and renderings in scratchboard, pen and ink, wash, watercolor, color, lettering, airbrush, and photo retouching.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Lettering and Layout	100 hours
Color	200 hours
Rendering Techniques	500 hours
Mechanicals	200 hours
General Illustration Practices	325 hours
Total	1325 hours

COURSE OUTLINE

Lettering and Layout **100 hours**

Leroy, freehand (brush-pen), art type, drawn letter, balance in arranging text and illustration on page.

Color **200 hours**

Color theory and application, techniques for full and limited color usage.

Rendering Techniques **500 hours**

Pen, ink, pencil (graphite, lith[illegible]bon), wash, watercolor, mixed mediums, textures, airbrush s[illegible]g, and photo retouching.

Mechanicals **200 hours**

Preparing art for reproduction, methods, machines, page make-up, reductions, identification, croping, opaquing.

General Illustration Practices **325 hours**

Preparing finished illustrations in all mediums in all methods used in the course to provide acceptable samples for use in presentation folder.

* Prerequisite—Technical Illustration I

TOOL DESIGN TECHNICIAN

Tool designers help plan and make drawings of special mechanical devices that are needed in production. Generally these devices might be classified as cutting tools, gages, dies, jigs, or fixtures. They vary in nature from simple hand tools to complex progressive dies.

To make these drawings, the tool designer must have ability in drafting and mathematics, along with a thorough knowledge of tool room and production practices. Under many conditions he will be given an idea or a suggestion and his job will be to develop this into a drawing of an efficient, economical tool. As a beginning tool designer he would be provided with more detailed information. He will plan the sequence of machine operations under various circumstances. Writing the program for tape-controlled machines is a tool designer activity.

Length of Course ..... **3300 hours**

Duration of Course ..... **2½ years**

COURSE UNITS

Bench Work	50 hours
Drill Press	10 hours
Engine Lathe	143 hours
Shaper	23 hours
Milling Machines	140 hours
Jig Borer	32 hours
Grinding Machines	120 hours
Automatic Screw Machines	120 hours
Tape Controlled Machines	23 hours
Heat Treating	46 hours
Die Making	92 hours
Quality Control	60 hours
Blueprint Reading	23 hours
Toolmaking Theory	144 hours
Basic Drafting	300 hours
Machine Drafting	200 hours
Cutting Tool Design	100 hours
Gage Design	84 hours
Die Design	375 hours
Fixture Design	375 hours
Programming	90 hours
Tool Design Theory	152 hours
Science	184 hours

Mathematics	276 hours
Technical Communications	92 hours
Economics and Job Procurement	46 hours
Total	3300 hours

COURSE OUTLINE

Bench Work — **50 hours**

Use of basic hand tools to produce layouts and objects by hand.

Drill Press — **10 hours**

Types of drill presses, drills, drill sharpening, drilling with jigs and to a layout.

Engine Lathe — **143 hours**

Turning, facing, boring, threading, drilling, faceplate and chuck setups, turning spherical surfaces, elliptical turning and boring.

Shaper — **23 hours**

Producing parallel and square surfaces.

Milling Machine — **140 hours**

End, slab, and straddle milling. Producing spur gears; spiral milling; cam milling; plain, compound, and differential indexing.

Jig Borer — **32 hours**

Producing holes by spacing using micrometer measuring instruments on the machine.

Grinding Machines — **120 hours**

Cylindrical grinding, surface grinding, internal grinding, thread grinding, tool and cutter grinding.

Automatic Screw Machine — **120 hours**

Setup, sequence of tooling, cam development, and time element.

Tape Controlled Machine — **23 hours**

Setup and operation of tape controlled production machine tools.

Heat Treating — **46 hours**

Normalizing, carburizing, hardening, tempering, and metallurgy.

Diemaking — **92 hours**

Forming dies, stamping dies, and feeding devices.

Quality Control — **60 hours**

The use of all types of precision instruments, as used to control the quality of work produced in the shop. Controlling the quality by the sampling method.

Blueprint Reading 23 hours

Learning to read mechanical drawings as submitted to the machine shop.

Toolmaking Theory 144 hours

Includes the theory connected with the various operations involved in the units of toolmaking; speeds, feeds, various processes, safety, applied mathematics, technical communications, and sciences pertaining to shop work.

Basic Drafting 300 hours

Use of instruments, geometric construction, orthographic projections, sectioning, auxiliary projections, dimensioning, threads, pictorial, developments, intersections, and descriptive geometry.

Machine Drafting 200 hours

Tolerances, castings, welded assemblies, gears, and cams.

Cutting Tool Design 100 hours

Design of single-edge cutting tools, boring bars, multiple-edge cutting tools, turret lathe and screw machine layouts.

Gage Design 84 hours

Design of plug gages, snap gages, ring gages, flush pin depth gage, thread gages, taper gages, length gages, and indicating gages.

Die Design 375 hours

Designing of cutting, forming, drawing, and cavity dies; simple progressive, and compound arrangements.

Fixture Design 375 hours

Design of leaf, tumble and trunnion jigs; plain, index, and trunnion milling fixtures; vise jaws, chuck jaws, lathe fixtures and adaptor plates; boring and grinding fixtures, welding fixtures.

Programming 90 hours

Writing of programs for point to point and contouring types tape controlled machines.

Tool Design Theory 152 hours

Classroom instruction of specific information affecting the design of the various tools.

Science 184 hours

Physics: matter, force and motion, work, energy and power, machines and heat. Chemistry: basic chemistry and chemistry of metals.

Mathematics 276 hours

General review of fractions, decimals, ratio and proportion, square root, rules of the right triangle, angles, areas, and volumes. Algebra

(thru quadratics), logarithms, slide rule, calculating machines, trigonometry, shop problems, and strength of materials.

Technical Communications **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking and technical report writing.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

ELECTRICAL CONSTRUCTION TECHNICIAN

The technician course is a broad, basic, and well-balanced course in practical electricity. The student's time is divided between electrical theory, practical laboratory instruction, and job experience.

The student is taught to lay out, assemble, install, and test electrical fixtures, apparatus, control equipment, light and power systems of building or other construction projects.

Projects are planned and installed from blueprints and specifications. Motor winding and repair may be taken at the option of the student, but is not compulsory for the electrical construction technician. Such phases of electrical work as magneti-switch coils, motor-control circuits, and transformer theory and ratios are thoroughly covered. The student is also given a background in basic electronics and the application of electronics to industrial purposes.

After having completed this program of study, the student should have a good foundation to qualify as an all-round electrician, both maintenance and construction, or as an electrical laboratory technician.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

DC Theory	244 hours
AC Theory	250 hours
Signal Wiring	50 hours
Lighting Wiring	150 hours
Motor and Control Wiring	200 hours

Conduit Installation and Wiring	200 hours
Electrical Drafting and Blueprint Reading	300 hours
Underwriters Code	100 hours
Electrical Laboratory	200 hours
Repair and Maintenance of Electrical Equipment	250 hours
Math	184 hours
Science	184 hours
Economics and Job Procurement	46 hours
Technical Communications	92 hours
Total	2650 hours

COURSE OUTLINE

DC Theory — 244 hours

Ohm's law, power law, wire calculations, batteries, permanent and electro-magnets, molecular theory of magnetism, meters and instruments, electrical terms, generation of current. Types of DC motors, series, shunt, and compound.

AC Theory — 250 hours

Inductance; reactance; impedance; leading and lagging current; power factor; Lenz's law converters and rectifiers; types of AC motors—shaded pole, split phase, repulsion induction, squirrel cage, slip ring induction, synchronous. Generation of alternating current, synchronizing AC generators.

Signal Wiring — 50 hours

Splicing wires, soldering and taping wires, simple bell circuits, bells and buttons in parallel, return call bell circuit, series bells with two buttons in parallel, annunciator circuits, master control of bells, constant ringing drop, door opener circuit, fire alarm circuits.

Lighting Wiring — 150 hours

A study of basic circuits, use of switches and various types of lighting and layout of lighting circuits; includes shop jobs of various types of hookups.

Motor and Control Wiring — 200 hours

Installation on machinery, mounting motors and wiring.

Conduit Installation and Wiring — 200 hours

Installation of conduits, pulling wires, and connecting and testing.

Industrial Electronics

Theory of electronic tubes, basic control circuits, electronic motor controls, and process controls.

Electrical Drafting and Blueprint Reading **300 hours**

Use of instruments, electrical symbols, shop sketching, straight line drawings, making and reading floor plans for electrical drawings.

Underwriters Code **100 hours**

Study of latest revised National Underwriters Code Book.

Electrical Laboratory **200 hours**

The hookup of various kinds of DC and AC motors and controllers, the operation of DC and AC generators and two or more generators in parallel.

Repair and Maintenance of Electrical Equipment **250 hours**

Trouble shooting on electrical circuits and equipment, repair of motors and motor rewinding at the option of the student. Repair of appliances, controllers, and motor starting equipment.

Math **184 hours**

This includes basic mensurations, logathrims, algebra, and trigonometry.

Science **184 hours**

A study of atomic and molecular behavior of matter, gravitational forces, force and motion, hydraulic and pneumatic principles, heat and temperature control, power and energy, control and use of sound, study of light and other electromagnetic vibrations, and basic theory of nuclear energy and nuclear fission.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Technical Communications **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

ELECTRICAL INSTRUMENTATION TECHNICIAN

The electrical instrumentation course is formulated to meet the demands of industry for electronics technicians capable of installing and maintaining all types of industrial electronic equipment.

In this course the student is given a thorough understanding of basic direct current and alternating current elec-

tricity; then advanced subjects such as theory of electronic tubes, motor controls, and process controls are covered in the classroom.

The student is taught to lay out, assemble, and wire basic electronic circuits in the laboratory, in preparation for "live" work jobs of actual electronic industrial equipment. He is taught to use electronic instruments such as oscilloscopes, vacuum-tube volt-ohmmeters, counters, signal tracers, wave generators, and computers.

This program of study should enable the student to qualify as an electronic technician in the employ of an engineering firm, or manufacturing plant.

Length of Course ..... 2650 hours
Duration of Course ..... 2 years

COURSE UNITS

DC Theory	200 hours
AC Theory	219 hours
Lighting Control	100 hours
Motor Control Circuits	150 hours
Electrical Drafting and Blueprint Reading	200 hours
Electronic Tube Theory	50 hours
Basic Control Circuits	150 hours
Electronic Motor Controls	75 hours
Process Controls and Servo-Mechanisms	200 hours
Semi-Conductors and Transistors	200 hours
Repair and Maintenance Electronic Equipment	150 hours
VHF and UHF Theory	100 hours
Micro-Wave Theory and Lab	175 hours
Computer Theory and Lab	175 hours
Mathematics	184 hours
Physics	184 hours
Economics and Job Procurement	46 hours
Technical Communications	92 hours
Total	2650 hours

COURSE OUTLINE

DC Theory 200 hours

Ohm's Law, power law, wire calculations, batteries, permanent and electro-magnets, molecular theory of magnetism, meters and instruments, electrical terms, generation of current, types of DC motors, series shunt and compound.

AC Theory **219 hours**

Inductance, reactance, impedance, leading and lagging current, power-factor, Lenz's law, convertors and rectifiers, types of AC motors. Shaded pole, split phase, repulsion induction, synchronous, squirrel cage, slip ring induction, generation of AC current, synchronizing AC generators.

Lighting Control **100 hours**

Installation of single pole, three-way and four-way master circuits, and low voltage controls.

Motor Control Circuits **150 hours**

Straight line switch, magnetic starters, drum starters, compensator starters, resistance starters, and slip ring control.

Electrical Drafting and Blueprint Reading **200 hours**

Use of instruments, electrical symbols, shop sketching, straight-line drawings, single-line drawings, assembly drawings, schematic drawings, and blueprint reading.

Electronic Tube Theory **50 hours**

Thermionic emission, vacuum tube characteristics, diodes, triodes, tetrodes, pentodes, characteristic curve plotting, gaseous rectifiers, thyratrons, shield-grid thyratrons. Types of photo-tubes, such as: photo-emissive, photo-conductive, and photo-multipliers. Ignitrons. Theory and use of tube testers.

Basic Control Circuits **150 hours**

Saturable reactors, magnetic amplifiers, vacuum tube amplifiers, semi-conductors such as: selenium, germanium, and silicon. "Heat-sink" principles, modular construction, etched circuitry, power rectification, and filtering.

Electronic Motor Controls **75 hours**

Thyratron speed controls, AC phase shift and DC amplitude controls, high vacuum tube controls, RC damping networks, antihunt circuits, saturable core reactors, and transformers.

Semi-Conductors and Transistors **200 hours**

Counting circuits, timing register control, go, no-go comparators, electro-mechanical control systems, servo principles, phase-shift voltage and current controls, binary counters, and multivibrators.

Repair and Maintenance of Electronic Controls **150 hours**

Use of test instruments such as: voltmeter, ammeter, ohmmeter, vacuum tube voltmeter, cathode ray oscilloscope. Process of localization and isolation of equipment trouble by trouble shooting. Preventive maintenance.

VHF and UHF Theory — **100 hours**

A study of these frequencies and the place they occupy in communications. Laboratory work with test equipment to demonstrate actual use.

Process Controls and Servo-Mechanisms — **200 hours**

A study of hydraulic, pneumatic, and electrical process control mechanisms. A study of servo motors, servo generators, and control transformers; and gear trains associated with automatic control equipment. Laboratory jobs to demonstrate use of servo-mechanisms.

Micro-Wave Theory and Laboratory — **175 hours**

A study of high-frequency short-wave phenomena and their application to electronics. Actual use of test equipment to check and align micro-wave systems.

Computer Theory and Laboratory — **175 hours**

A study of digital and analog computers, go and no-go comparators, and binary counters. Buildup of computer circuits and components and use of test equipment to check and align same.

Mathematics — **184 hours**

This includes basic mensurations, logathrims, algebra, and trigonometry.

Physics — **184 hours**

A study of atomic and molecular behavior of matter, gravitational forces, force and motion, hydraulic and pneumatic principles, heat and temperature control, power and energy, control and use of sound, study of light and other electromagnetic vibrations, and basic theory of nuclear energy and nuclear fission.

Economics and Job Procurement — **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Technical Communications — **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

ELECTRIC MOTOR WINDING AND REPAIRS

This course is intended to qualify the student in all types of electric motor repairs and the repair of all types of electrically operated household appliances (with the exception of refrigerators and air conditioners).

The student's time is divided between electrical theory and practical work. During the practical work period the student learns how to rewind direct current armatures and fields, alternating current motors of the split-phase type, the capacitor-start type, the repulsion-induction type, the shaded-pole type, and the three-phase type. In addition, he lears how to replace bearings, cut commutators on the engine lathe, and to test the completed motor for proper operation.

The student learns how to make repairs to most of the commonly used household appliances. Upon completion of the course of instruction the student should be able to assist in an appliance repair shop and to eventually become an all-around appliance repairman.

Length of Course ..... **1988 hours**
Duration of Course ..... **1½ years**

COURSE UNITS

Direct Current Electric Theory	200 hours
Alternating Current Electric Theory	200 hours
Motor Winding and Repairs	800 hours
Household Appliance Repairs	225 hours
Repairing and Wiring Motor Controllers	80 hours
Repair and Operation of Transformers and Rectifiers	30 hours
Trouble Shooting on Plant Electrical Equipment	200 hours
Use of Testing Equipment	110 hours
Machine Shop Practice	97 hours
Economics and Job Procurement	46 hours
Total	1988 hours

COURSE OUTLINE

Direct Current Electric Theory **200 hours**

Ohm's law, power law, magnets, generation of DC current, wire calculations, DC motors and generators; series, shunt, and compound. Connection and use of meters.

Alternating Current Electric Theory **200 hours**

Inductance, reactance, impedance, leading, and lagging current. Lenz's law, electro-magnetic induction. Types of AC motors: shaded pole, split phase, repulsion induction, squirrel cage, slip ring induction, and synchronous. Generation of AC current.

Motor Winding and Repairs **800 hours**

Replacing bearings, inspection and testing, rewinding and insulation, data sheets, and lubricating.

Household Appliance Repairs (Articles supplied by students) 225 hours

Electric irons: replacement of cords, heating elements, testing, and adjusting thermostats. Repairs to toasters, waffle irons, hair dryers, vacuum cleaners, etc. Rewiring and testing electric stoves.

Repairing and Wiring Motor Controllers 80 hours

Starting methods, replacing contacts, automatic accelerating devices, overload protection.

Repairs and Operation of Transformers and Rectifiers 30 hours

Calculating rewinding and phasing transformer coils, selenium cell and vacuum tube fundamentals.

Trouble Shooting on Plant Electrical Equipment 200 hours

Circuit tracing, megger testing for shorts, open and ground. Checking and replacing contacts, coils, etc.

Use of Testing Equipment 110 hours

Proper usage of voltmeter, ammeter, ohmmeter, megger power analyzer, ammeter shunts, current transformers, and wheatstone bridge.

Machine Shop Practice 97 hours

Use of drill press. Use of lathe making bearings, turning, boring, etc., proper use of hand tools.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

TOOLMAKER

The major trend in industry is the rapidly increasing demand for semi-professional technical workers. The growing complexity of industrial processes requires teams of workers with technical knowledge and manual skills to help scientists and engineers produce their ideas. Demands will grow for the technically trained toolmaker who will further develop into a leader to produce the wonders that are to come.

There are over 150 machine tools in the machine shop at the Williamsport Technical Institute. Training is given on equipment that is basic to all machine shop work.

The toolmaking course is designed to give emphasis on skills, adding only the related work and shop theory that is necessary.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Bench Work	120 hours
Drill Press	100 hours
Engine Lathe	358 hours
Shaper	90 hours
Milling Machine	300 hours
Jig Borer	90 hours
T. L. and Auto. Screw Machine	300 hours
Grinding Machines	300 hours
Punch Press	20 hours
Heat Treating	120 hours
Die Making	200 hours
Quality Control	120 hours
Blueprint Reading	46 hours
Mathematics	92 hours
Sketching	60 hours
Economics and Job Procurement	46 hours
Toolmaking Theory	288 hours
Total	2650 hours

COURSE OUTLINE

Bench Work — **120 hours**

Learning to use basic hand tools, producing layouts and objects by hand. Use of height gage, gage blocks, fitting and assembly.

Drill Press — **100 hours**

Types of drill presses, drills, drill sharpening, drillng with jigs and to a simple layout. Setup and drilling to very close layout. Drilling to magnified lines.

Engine Lathe — **358 hours**

Turning, facing, boring, thread cutting and drilling in the lathe. Advanced setups on faceplate and chuck. Turning spherical surfaces, elliptical turning and boring. American, British and metric thread cutting.

Shaper — **90 hours**

Producing parallel surfaces, square and rectangular objects. Angles, dovetails, radii and irregular shapes.

Milling Machine — **300 hours**

End, slab, and straddle milling. Producing spur gears. Plain indexing. Spiral milling, cam milling, compound and differential indexing.

Jig Borer 90 hours

Producing holes and very accurate spacing by using micrometer measuring instruments on the machine.

T. L. and Auto Screw Machines 300 hours

Setups, sequence of tooling, cam development and time element.

Grinding Machines 300 hours

Cylindrical grinding, surface grinding, internal and grinding tools. Grinding threads.

Punch Press 20 hours

Operation of the punch press. Producing repetitive parts on the production basis by using punch and die on the machine.

Heat Treating 120 hours

Normalizing, carburizing, hardening, and tempering. Basic metallurgy.

Diemaking 200 hours

Forming dies, allowance for bends. Stamping dies, clearance between punch and die and feeding mechanism.

Quality Control 120 hours

The use of all types of precision tools and instruments as used to control the quality of work produced in the shop. Controlling the quality by the sampling method.

Blueprint Reading 46 hours

Learning to read mechanical drawings as submitted to the shop.

Mathematics 92 hours

General review of fractions, decimals, ratio and proportion, square root. Rules of the right triangle, angles, areas, and volumes. Elementary trigonometry.

Sketching 60 hours

Making free hand workable sketches to carry the message to the shop from field work or from department to department.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Toolmaking Theory 288 hours

Includes the theory connected with the various operations involved in the units of toolmaking. Speeds and feeds, safety, and the application of mathematics and science to shop work.

TOOLMAKING TECHNICIAN

This course applies emphasis on related subjects such as advanced mathematics, technical communications, and science. It is designed for the person who has the personality and aggressiveness to advance to a position of leadership in industry.

Predictions are that upon graduation employment will be no problem. Our students are being interviewed even before course completion. Industries have been coming to us for prospective employees over a 200-mile radius. A few of the larger industries hiring our students are: Sylvania Electric Products, Inc., Bethlehem Steel, Thompson Products, Western Electric, National Cash Register, and many other tool and die manufacturers.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Bench Work	100 hours
Drill Press	20 hours
Engine Lathe	286 hours
Shaper	46 hours
Milling Machine	280 hours
Jig Borer	64 hours
Grinding Machines	240 hours
Automatic Screw Machines	240 hours
Heat Treating	92 hours
Diemaking	184 hours
Quality Control	120 hours
Blueprint Reading	46 hours
Mathematics	230 hours
Economics and Job Procurement	46 hours
Sketching	46 hours
Technical Communications	92 hours
Science	184 hours
Programming	46 hours
Shop Therapy	288 hours
Total	2650 hours

COURSE OUTLINE

Bench Work **100 hours**

Use of basic hand tools to produce layouts and objects by hand.

Drill Press — 20 hours

Types of drill presses, drills, drill sharpening, drilling with jigs and to a layout.

Engine Lathe — 286 hours

Turning, facing, boring, threading, drilling, faceplate and chuck setups; turning sperical surfaces, elliptical turning and boring.

Shaper — 46 hours

Producing parallel and square surfaces.

Milling Machines — 280 hours

End, slab, and straddle milling. Producing spur gears; spiral milling; cam milling; plain, compound, and differential indexing.

Jig Borer — 64 hours

Producing holes by spacing—using micrometer measuring instruments on the machine.

Grinding Machines — 240 hours

Cylindrical grinding, surface grinding, internal grinding, thread grinding, tool and cutter grinding.

Automatic Screw Machines — 240 hours

Setup, sequence of tooling, cam development and time element.

Heat Treating — 92 hours

Normalizing, carburizing, hardening and tempering. Metallurgy.

Diemaking — 184 hours

Forming dies, allowance for bends. Stamping dies, clearance between punch and die. Feeding devices.

Quality Control — 120 hours

The use of all types of precision instruments as used to control the quality of work produced in the shop. Controlling the quality by the sampling method.

Blueprint Reading — 46 hours

Learning to read mechanical drawings as submitted to the machine shop.

Mathematics — 230 hours

General review of fractions, decimals, ratio and proportion, square root. Rules of the right triangle, angles, areas and volumes, algebra, logarithms, slide rule, trigonometry and shop problems.

Economics and Job Procurement — 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Sketching **46 hours**

Making free hand workable sketches to carry the message between engineering, the shop, or field work.

Technical Communications **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letter of application, note taking, technical report writing.

Science **184 hours**

Physics: matter, forces and motion, work and energy, power, machines and heat. Chemistry: basic chemistry and chemistry of metals.

Programming **46 hours**

Programming for automatic production.

Shop Theory **288 hours**

Includes the theory connected with the various operations involved in the units of toolmaking. Speeds, feeds, various processes, safety, applied mathematics, technical communications and science pertaining to shop work.

OFFICE MACHINE SERVICEMAN

The office machine serviceman has interesting work, pleasant surroundings, and good opportunities in his field. Men with pleasing personalities and mechanical skills will find employment with manufacturers of office equipment, with appliance sale agencies or in opening their own small businesses.

The student in this course will be trained to perform periodic inspection of different types of office equipment; to dust, clean, and oil machines; to replace ribbons or rubber parts; and to make minor adjustments.

Men with various physical handicaps frequently find this field a good solution to their vocational problems. However, handicapped students should confer with the school or authorized vocational counselors before finally selecting the course.

Length of Course ..... **1675 hours**
Duration of Course ..... **15 months**

COURSE UNITS

Introduction to Typewriters	200 hours
Theory of Operation	100 hours
Disassemble and Reassemble	164 hours
Main Frame	425 hours
Carriage	425 hours
Adding Machine Service	35 hours
Calculating Machine Service	35 hours
Duplicating Machine Service	35 hours
Related Subjects	50 hours
Refinishing	60 hours
Shop Practice	100 hours
Economics and Job Procurement	46 hours
Total	1675 hours

COURSE OUTLINE

Introduction to Typewriters — 20 hours
Underwood, Smith, Royal, Remington, Woodstock, and R. C. Allen.

Theory of Operation — 100 hours

Disassemble and Reassemble — 164 hours

Main Frame — 425 hours
Base and key lever, type bar and segment, ribbon (feed and reverse), bichrome, and escapement.

Carriage — 425 hours
Paper feed, tabulator, margins, back spacer.

Adding Machine Service — 35 hours
Clean, oil, replace tape, replace ribbon.

Calculating Machine Service — 35 hours
Clean, oil.

Duplicating Machine Service — 35 hours
Operation, clean, oil.

Related Subjects — 50 hours
Electricity, blueprint reading, and workable drawings.

Refinishing — 60 hours
Smooth—preparation and spraying; wrinkle—preparation, spraying, and baking.

Shop Practice — 100 hours
Bench work, lathe, and drill press.

Economics and Job Procurement — 46 hours
Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

*OFFICE MACHINE TECHNICIAN

Outstanding opportunities are available to men trained as technicians in the office machines industry. Emphasis on labor-saving devices has increased the need for men skilled in the servicing and repairing of this equipment.

To be eligible for the technician course, students must first satisfactorily complete the office machine serviceman course. Training includes detailed operation, functions of component parts and sections, diagnosing of machine troubles, and the testing of machines.

Math, physics, and technical communications are also presented to develop the individual to meet the requirements of today's office machine technician.

Length of Course ..... **975 hours**
Duration of Course ..... **9 months**

COURSE UNITS

Adding Machines	200 hours
Calculating Machines	115 hours
Duplicators	200 hours
Physics	184 hours
Mathematics	184 hours
Technical Communications	92 hours
Total	975 hours

COURSE OUTLINE

Adding Machines — **200 hours**

Operation for testing, function operation of the component, diagnosis of trouble by reading tape, electricity, and workable drawings.

Calculating Machines — **115 hours**

Operation for testing, functional operation of the component section, electricity, working drawings.

Duplicators — **200 hours**

Detailed operation, functional operation of the component section, stencil and scope work, electricity, and working drawings.

Physics — **184 hours**

Basic: matter, force, and motion; work energy and power machines; and heat. Electronics: electrical circuits for office machines—a study of the components of these circuits; procedure for checking continuity; and practice sketching of these circuits. Electronic fundamentals—atomic and electronic theory, magnetism, electrical magnetic induction, transformers, solenoids, condensors, and resistors.

Mathematics 184 hours

Algebra, through quadratics; logarithms; slide rule; trigonometry; shop problems; and strength of materials.

Technical Communications 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

° Prerequisite—Office Machine Serviceman

PATTERNMAKER — WOOD

Patternmaking is the technique of preparing, shaping, or building wood and adaptable materials into models. These models are used in the foundry to make molds into which molten metal is poured to produce casings.

Pattern making is a highly skilled craft and requires a great degree of accuracy. It is one of the highest paid skilled trades in manufacturing. Because he learns the basic woodworking skills, a wood patternmaker can also qualify for skilled woodworking jobs such as cabinetmaker.

While a graduate of this course would not be classified as a journeyman, his training would be credited toward completion of his apprenticeship period.

Length of Course 2650 hours
Duration of Course 2 years

COURSE UNITS

Blueprint Reading	129 hours
Bench Work	647 hours
Lathe Operations	196 hours
Core Prints	13 hours
Pattern Construction	490 hours
Core Box Construction	400 hours
Wood Working Machines	54 hours
Pattern Requisites	18 hours
Foundry Practice	72 hours
Shop Theory	324 hours
Master Patterns	77 hours
Mathematics	92 hours
Economics and Job Procurement	46 hours
Technical Communications	92 hours
Total	2650 hours

COURSE OUTLINE

Blueprint Reading — **129 hours**

Orthographic projection, interpretation of one, two, or more views. Sectional view drawings, and assembled drawings.

Bench Work — **647 hours**

Care and use of hand tools, one-piece patterns, green sand cored patterns, split or parted patterns, and pattern layouts. Patterns with irregular partings, patterns of assembled parts, and checking patterns and core boxes.

Lathe Operations — **196 hours**

Turning between centers, split pattern turning, face plate turning, cylindrical turning, shoulder turning, re-chucking, and turning to a templet. Eccentric turning, straight and tapered turning, and turning irregular parting.

Core Prints — **13 hours**

Function, selection, proportioning and identification of core prints; cope and drag; vertical, horizontal, balanced, tail, and cover core prints.

Pattern Construction — **490 hours**

Lagged, spider, sectional, sweep work and follow boards. Solid types split, plate, and web, stepped up segmental, skeleton wheel construction, laminated, and boxed follow boards.

Core Box Construction — **400 hours**

Core boxes with fillers, loose pieces, and with interchangeable members. Dump box; half box for square or rectangular cores; semicircular boxes, right and left hand boxes; segmental, stepped up, cover core boxes, and ram up cores.

Wood Working Machines — **54 hours**

Jointer, surfacer, band saw, variety saw, vertical drill press, speed lathe, patternmaker's lathe, disc sander, oscillating spindle sander, bench model drill press, universal grinder, tool grinder, band saw filing and setting. Repairing of equipment, setting up equipment for production; care and maintenance of equipment. Jig and fixtures.

Pattern Requisites — **18 hours**

Pattern lumber, glues, shellac, wood screws, brads, finishing nails, common wire nails, fillets, abrasives, wood dowels, metal dowels, pattern letters and numerals, alcohol, oils, and bees wax.

Foundry Practice — **72 hours**

Molding materials; molding tools; mold making and core making; match plate work; and molding machines.

Shop Theory 324 hours

Pertaining to bench work, lathe operation, core prints, pattern construction, core box construction, wood working machines, pattern requisites, and foundry practice.

Master Patterns 77 hours

Double shrinkage, follow boards, match plate, core sticks, core driers, pressure plate work, mounting, and gating.

Mathematics 92 hours

General math review; elementary algebra; elementary trigonometry; slide rule; and logarithms.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Technical Communications 92 hours

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

PLUMBER

Students who complete the plumbing course are thoroughly trained in all phases of installation, alteration, and repair of pipe systems. Good employment opportunities are available with plumbing contractors, public utilities, aircraft and shipbuilding industries, and commercial and business establishments or through self-employment.

Students are first taught the fundamentals such as mathematics, blueprint reading, use of hand tools, pipe threading and fitting. Next the layout of soil, waste, and vent pipes are covered. Instruction on hot and cold water distribution for domestic use, sewage systems, and the maintenance of household and industrial plumbing completes the course.

Duration of Course ..... **2650 hours**
Length of Course ..... **2 years**

COURSE UNITS

Mathematics for the Plumber and Fitter ..... 150 hours
Use of Tools ..... 125 hours
Venting ..... 300 hours

Drainage	404 hours
Boilers (Vertical and Horizontal)	125 hours
Septic Tanks	50 hours
Blueprint Reading and Estimating	150 hours
Building Maintenance	500 hours
Lead Work (Basic)	275 hours
Hot and Cold Water Distribution	225 hours
Shop Theory	300 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Mathematics for the Plumber and Fitter — **150 hours**

Instructions in making isometric drawings, pipe capacities, percentages, offsets, angles, pipe sizes, fittings, etc.

Use of Tools — **125 hours**

Use of tools used by plumbers to cut and thread iron pipe, sweat copper fittings and pipes, caulking joints, lead tools, safety bend pipe, power tools, etc.

Venting — **300 hours**

This unit covers continuous, circuit, loop, relief, and wet units, traps, water closets, plumbing materials, ventilation of toilet rooms, by-passes on plumbing systems, stack venting, double vents, unit vents, siphonage, vent sizes, etc.

Drainage — **404 hours**

This unit covers testing of plumbing systems, drainage from lavatories, water closets, bathtubs, sinks, bars and soda fountains, area drains. Pipe sizes, yard drains, by-passes, etc.

Boilers (Vertical and Horizontal) — **125 hours**

Water fronts and coils, circulation, quick heating connections, coal-water heaters, direct and tank hot water systems, boiler explosions, repairs, relief valves, double boilers, estimating stove and furnace coils, theory of circulation.

Septic Tanks — **50 hours**

Filter beds, sub-soil irrigation, location, connections, soil, cesspools, cesspool construction, types of cesspools, and septic tanks.

Blueprint Reading and Estimating — **150 hours**

Signs and symbols for blueprint reading, use of estimating sheets, labor, materials, take-off estimating of materials, isometric drawing, and trade terms.

Building Maintenance 500 hours

Care and repair of and installing new flush valves, gate valves, globe valves, seats, washers, water lines, air lines, gas lines, steam lines, waste and soil lines, vents, tools, open stopped waste and soil lines, water closets, lavatories, urinals, drinking fountains, tubs, sinks, repair of faucets and bibbs, and pumps.

Lead Work (Basic) 275 hours

Use of lead working tools, joint wiping, method of bending lead pipe, preparing wiped joints, and tricks of the trade.

Hot and Cold Water Distribution 225 hours

Drinking fountains, water pumps, rams, water siphons, bathtubs, sinks. Cold water mains and risers, hot and cold water to water closets, lavatories, and country plumbing.

Shop Theory 300 hours

Shop theory is distributed throughout the course units.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

*PLUMBER — LEAD WORK

Upon the satisfactory completion of the plumbing course, students may elect the one-year advanced course in lead work and joint wiping. This additional training is needed by students who plan to seek employment in areas covered by plumbing codes.

Length of Course ..... **1100 hours**
Duration of Course ..... **10 months**

COURSE UNITS

Soldering with Irons (Coppers)	210 hours
Bending Lead Pipe	85 hours
Wiping Joints	410 hours
Lead Pans and Linings	170 hours
Shop Theory	225 hours
Total	1100 hours

COURSE OUTLINE

Soldering with Irons (Coppers) **210 hours**

Preparing and tinning the soldering iron, tinning brass fittings, soldering flat seams and sheet lead, soldering angle seams on sheet lead, soldering lead pipe to closet floor flange, making cup joint, making overcast joints.

Bending Lead Pipe **85 hours**

Bending lead waste pipe with sand, bending lead waste pipe with spring, use of lead dresser, making offsets.

Wiping Joints **410 hours**

Care and cleaning of wiping solder, preparing wiping cloths, preparing and wiping floor flange joints, preparing and wiping horizontal round joints, preparing and wiping vertical branch joints, preparing and wiping horizontal branch joints, preparing and wiping lead to brass and copper, solder nipple to waste pipe, brass ferrules, capping lead stubs, preparing and wiping vertical round joints.

Lead Pans and Liners **170 hours**

Folding or pigear corners, patterns for cutting and preparing sheet lead, bossing corners, folding, bending corners, etc.

Shop Theory **225 hours**

Shop theory is included in all units of work.

* Prerequisite—Plumber

OFFSET AND LETTERPRESS PRINTER

The purpose of this course is to provide a broad and working knowledge of printing by the process of photo-lithography and a basic knowledge of letterpress printing. Practical, related, and individual instruction is given in all units of this course. The unit hours are arranged to give the student a rounded knowledge of all types of printed matter including school newspapers, periodicals, catalogs, forms, pamphlets, and other material prepared and used in the commercial printing plant. Units include color and black and white.

The student considering entry should have a sincere desire to master the skills involved, along with a real interest, good attitude and cooperative manner above the average. Students are taught not only "do and know" skills, but also

good personal and safety habits that will develop the character and personality necessary for cooperation and work with fellow employees in the trade.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Copy Preparation—Layout	600 hours
Camera	500 hours
Platemaking	150 hours
Press Operation	750 hours
Photo Finish	150 hours
Silk Screen and Photo-Stat	100 hours
Bindery	60 hours
Letterpress	294 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Copy Preparation—Layout **600 hours**

Basic principles of offset lithography and safety, opaquing techniques, paper cost and estimating, preparing copy for photography, paste-up, ruling pen, principles of design, imposition of negatives, kinds of layouts and dummies, layout procedures and math, determining press size and trim sizes, production, and shop terms.

Camera **500 hours**

Darkroom procedures, mixing chemicals, exposure development, filtration, line photography, halftone photography, camera math, kinds of film and use, housekeeping and safety, lighting, care and use of equipment, making positives, tints, and color separation.

Platemaking **150 hours**

Basic principles of lithography, use and care of chemicals, safety, plate graining, kinds of plates and making of same, care and handling, filing of flats, coated and presensitized plates, platemaking procedures and troubles, and production.

Press Operation **750 hours**

Safety, Harris Press, handling paper, press settings and adjustments, Web Press, inks, driers, varnishes, mixing, dampner systems and settings, housekeeping, press troubles, chemicals, shop terms, production.

Photo Finish **150 hours**

Darkroom procedures, chemical mixing and care, safety, kinds of developers, papers—kinds and use, fixing, exposure, black and white, roll film, speed graphic picture taking (4x5), copying (4x5 and 8x10), special assignments, printing and enlarging, color photography, lighting arrangement and flash.

Silk Screen and Photo-Stat **100 hours**

Darkroom procedure, chemicals, exposure and filtration, development, preparing screen and frame, inks—mixing, screen printing —project and production.

Bindery **60 hours**

Safety, folding machine, plastic binding, cutting paper (automatic machine), padding, drilling, stitching, collating, inspection, identification of papers, wrapping the finished job, perforating, trimming finished job, organization and performing production.

Letterpress **294 hours**

Basic principles of letterpress printing, safety, hand composition, type indentity and calculation, hand feed presses, automatic presses, production.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

ELECTRONICS TECHNOLOGY

Graduates of this course will enter industry as electronic technicians. The number of electronic technicians graduated each year in the United States consistently falls below the needs of industry.

The first year of the course is spent mastering the basic principles of electron theory and practice. Advanced electronic theory including servo-mechanisms and micro-wave is covered during the second year in addition to "live" projects on all types of electronic equipment.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Basic Radio Physics	375 hours
Advanced Radio Physics	300 hours
Basic Radio Laboratory Practice and Techniques	650 hours
Advanced Laboratory Practice and Techniques	662 hours
Elementary Physics	150 hours
Advanced Physics	150 hours
Basic Math	150 hours
Advanced Math	75 hours
Economics and Job Procurement	46 hours
Technical Communications	92 hours
Total	2650 hours

COURSE OUTLINE

Basic Radio Physics **375 hours**

Energy propogation, theory of sound, electron theory, electrical units, magnetism, electro-magnetic induction, electro-magnetic devices, electrical filters, inductance and inductors, capacitance and capacitators, AC circuit characteristics. Measuring instruments.

Advanced Radio Physics **300 hours**

Vacuum tube theory; detection, amplification, rectification, oscilliation. Amplitude modulation; frequency modulation; fundamentals of television; public address equipment; intercommunications systems; carrier current system; service equipment; service methods; servicing special circuits; special television and radio service problems, including television cameras.

Basic Radio Laboratory Practice and Techniques **650 hours**

Identification of components, use of hand tools, soldering, learning to follow schematics, continuity testing, basic test equipment, simple construction operation and testing, advanced construction operation and testing, and simple trouble shooting on radio receivers.

Advanced Laboratory Practice and Techniques **662 hours**

Use of advanced test equipment; advanced trouble shooting; industrial electronics construction; testing maintenance and repair; practical experience in trouble shooting and repairing "live" television and radio jobs in school laboratory; closed circuit television; practice and maintenance.

Elementary General Physics **150 hours**

Structure and properties, measurement, mechanics of liquids and gases, behavior of molecules, forces, vectors, laws of motion (linear and rotary), simple machines, work power, energy, efficiency, friction.

Advanced General Physics **150 hours**

Gearing; screw fasteners; mechanisms; heat—its measurement, effects, and methods of transfer; change of state with heat; heat and work; light—its nature, measurement and behavior; optical instruments, color, polarized light, spectroscopy.

Basic Math **150 hours**

Review of fudamental operations; significant figures and powers of ten; basic algebra; graph plotting and vectors; and basic trigonometry.

Advanced Math **75 hours**

Use of slide rule (all 9 basic scales), logarithms—including applications to decibles and AC formulas. Kirchoff's law.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

Technical Communications **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, technical report writing.

SHEET METAL WORKER

This course may be used by the student to become a general sheet metal worker and to set up his own business or to become a sheet metal helper.

Men interested in air conditioning installation and other trades utilizing sheet metal, will find it an excellent course. All the fundamentals of the trade are taught; fundamentals of general sheet metal work, seams, hems, wiring, soldering, using the brake, squaring shears, combination machines, grooving machines, sheet metal work for the tinner, roofer and the furnace machines.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Sheet Metal Drafting	450 hours
Forge Practice	30 hours
Metal Forming	250 hours

Combination Machines	400 hours
Soldering	50 hours
Power Machines	378 hours
Bench Work	600 hours
Oxy-Acetylene Welding	200 hours
Related Instruction and Shop Theory	200 hours
Basic Math	46 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Sheet Metal Drafting — **450 hours**

Practical geometry, parallel line development, layout cornice and gutter work, radial line development, layout, triangulation, skylights, special problems.

Forge Practice — **30 hours**

Care and operation of forge. Toolmaking, heat treating, forging, and hand welding.

Metal Forming — **250 hours**

Polls, stakes, blocks, punch and die, brake, bar folder, metal spinning.

Combination Machines — **400 hours**

Turning, beading, crimping and beading combination, burring, setting down, wiring, grooving, adjusting and maintaining, and elbow and edging machine.

Soldering — **50 hours**

Tin, galvanized iron, copper, brass, zinc, steel, lead, and pewter.

Power Machines — **378 hours**

Drill press, squaring shears, emery wheels, band saw, hack saw, spot, welding, and hand drills.

Bench Work — **600 hours**

Riveting, hand grooving, sawing, chiseling, shearing, elbows, round pipe, rectangular pipe, metal fittings, and seaming.

Oxy-Acetylene Welding — **200 hours**

Flat, vertical, and overhead welding on cast iron, steel, brass, and all light gages of sheet metal.

Related Instruction and Shop Theory — **200 hours**

Theory; blueprint reading.

Basic Math **46 hours**

General math review—fractions, decimals, etc.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

NEON TUBE BENDER

The art of bending and pumping tubing for the advertising trade is now an important and profitable business. A student first learns the properties of the glass and the characteristics of the materials used. Then he is taught to bend right angles, "U" bends, script, block letters, and pumping operation. All bending and pumping operations are taught using 12mm and 15mm tubing.

The course also includes apparatus blowing and repairing of pyrex diffusion pumps, glass manometers, manifold set-up and maintenance, and the fabrication of pressure gages. Modern lighting problems are constantly studied and cold cathode tubes are made and field tested by the students.

When this course is taken in conjunction with sign painting, the student then possesses a rounded knowledge which will permit him to do any type of sign work.

Lenght of Course ..... **1350 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Properties of Glass	30 hours
Angle Bends	300 hours
U-Bends	300 hours
Circular Bends	300 hours
Simple Apparatus Blowing	44 hours
Bombarding and Pumping	150 hours
Related Subjects	180 hours
Economics and Job Procurement	46 hours
Total	1350 hours

COURSE OUTLINE

Properties of Glass 30 hours

An outline of the different kinds of glass, at what temperature they melt and the purposes of each one. Learning what makes glass break and what to do to overcome this.

Angle Bends 300 hours

Learning to make different angle bends using different size tubing, keeping the wall thickness the same.

U-Bends 300 hours

Learning to make "U" bends, drop downs and back bends keeping the tubing the original roundness.

Circular Bends 300 hours

Circular bends as made in the ribbon fires in fabrication of large curvature designs and round letters.

Simple Apparatus Blowing 44 hours

Simple apparatus blowing will cover the fabrication of bulbs, tubes, and ring seals.

Bombarding and Pumping 150 hours

Bombarding is learning to apply the necessary high voltages and then evacuating the completed tube to drive out all air, moisture, and impurities.

Related Subjects 180 hours

Tubulating, use of hand torch, making asbestos patterns, blacking out tubing, and mounting window signs.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

SIGN PAINTER

The instruction offered in sign painting gives the student a broad background which will enable him to make a start in his own business or to work for a commercial sign shop.

The student is taught to visualize and sketch the design for any type commercial sign, to complete the sign in different media, and then to properly locate and install it.

Length of Course ..... 2650 hours
Duration of Course ..... 2 years

COURSE UNITS

Basic Principles of Lettering	850 hours
Phases in Construction Layout	850 hours
Use of Gold, Silver, and Aluminum Leaf	75 hours
Commercial Displays	500 hours
Pen and Ink Drawings	25 hours
Screen Process	179 hours
Related Subjects	125 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Basic Principles of Lettering **850 hours**

The use of correct materials, tools, etc. The actual completion of ordinary plain work.

Phases in Construction Layout **850 hours**

Posters, bulletins, and trucks. Outlining, shading, and the more intricate phases in construction layouts, patterns, sketches, etc.

Use of Gold, Silver, and Aluminum Leaf **75 hours**

In numerous effects for various purposes. Also in linings and striping.

Commercial Displays **500 hours**

Wood, metal, and plastic designs.

Pen and Ink Drawings **25 hours**

For newspaper cuts, scrolls, etc. A review of any parts of the course in which individual trainees may desire to become more proficient.

Screen Process **179 hours**

Window signs, show cards, banners, and cut-outs.

Related Subjects **125 hours**

Making neon patterns; wiring of flashers and chasers; pictorials and blending colors; sign erection procedures; and estimating.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment .

WELDER — ACETYLENE

This course is designed for the man who wishes to become a general acetylene welder. Welding training is given on all thicknesses of ferrous and non-ferrous metals with all common tools and appliances.

Considerable oxy-acetylene welding is usually done in industrial plants such as sheet metal, light steel fabricating, iron foundries, garages, pipe shops and job welding shops.

Length of Course ..... **650 hours**
Duration of Course ..... **6 months**

COURSE UNITS

Position Welding	250 hours
Pipe Welding	120 hours
Cast Iron Welding	12 hours
Testing of Welding Specimens	6 hours
Alloy Welding and Brazing	100 hours
Acetylene Cutting	6 hours
Aircraft Welding	110 hours
Economics and Job Procurement	46 hours
Total	650 hours

COURSE OUTLINE

Position Welding — **250 hours**

Flat, vertical, horizontal, and overhead position.

Pipe Welding — **120 hours**

Joints, tee welds, welding in flat position, welding in vertical and overhead positions.

Cast Iron Welding — **12 hours**

Auto blocks, heads, and gear teeth.

Testing of the Welded Specimens — **6 hours**

Standard methods for mechanical testing of welds. Tensile, guided hand, fillet and nick break tests. Free bend tests, etch, X-ray tests.

Alloy Welding and Brazing — **100 hours**

Stainless steel welding, aluminum welding, white metal welding, copper brazing, lead welding, monel metal welding, bronze brazing.

Acetylene Cutting — **6 hours**

Operation of the radio-graph and hand cutting.

Aircraft Welding **110 hours**

Vertical, horizontal, and overhead welding.

Economics and Job Procurement **46 hours**

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.

WELDER — ELECTRIC

Those who complete this course are qualified as general electric-arc welders. Training is given in the theory and practice of all phases of electrical welding. Practical experience is gained throughout the course.

Jobs in electric welding are found in industrial establishments such as boiler shops, heavy equipment manufacturers, structural steel fabrication, railroads, steel mills, and welding shops.

Length of Course ..... **650 hours**
Duration of Course ..... **6 months**

COURSE UNITS

Position Welding	412 hours
Pipe Welding	130 hours
Cast Iron Welding	12 hours
Control of Heat and Molten Metals	12 hours
Sheet Metal Welding	30 hours
Railroad and Structural Steel Welding	18 hours
Forge Practice	18 hours
Weld Tests	18 hours
Total	650 hours

COURSE OUTLINE

Position Welding **412 hours**

Flat, vertical, and overhead welding.

Pipe Welding **130 hours**

Flat, vertical, and overhead welding.

Cast Iron Welding **12 hours**

Auto blocks and heads. Machine parts.

Control of Heat and Molten Metals **12 hours**

Controlling molten metal in flat, vertical and overhead positions.

Sheet Metal Welding — **30 hours**

Butt welds, lap welds in flat and vertical positions.

Railroad and Structural Steel Welding — **18 hours**

Rail ends, fire box welding, frame padding, building up rivet heads.

Forge Practice — **18 hours**

Scarfing for butt, lap, and split welds. U and I bolts, hooks, chain links.

Weld Tests — **18 hours**

Testing various welds.

*WELDING TECHNICIAN

The welding technician course takes in all the phases of both the electric and acetylene welding courses, plus heli-arc welding, testing by X-ray and other methods, and more intensive training in related subjects.

A combination welder is a more valuable worker to an employer than a man who can weld with but one of the other processes. He is not limited in his work program or environment if he can qualify as a good technician. For instance the job or repair shop, this work calls into play every trick of the welder's art and hands him one challenge after another. The oil fields, pipeline, and construction jobs offer great opportunities and the wages are among the highest. The fabricating plants provide an attractive career. Here he can observe different details and engineering designs. The more observant he is, the greater his chances are to advance because of his practical knowledge.

There are many more situations for a good technician —shipbuilding, aircraft, railroads, heavy road machinery, and industrial pipe contractors. In all of these there is work to be done and they afford abundant opportunity.

Length of Course ..... **1325 hours**
Duration of Course ..... **1 year**

COURSE UNITS

Advanced Acetylene Welding	240 hours
Electric Welding (Code)	250 hours
Inert Arc Welding	130 hours
Physical Testing of Steel and Inspection	100 hours
Blueprint Reading and Layout	120 hours

Mathematics	184 hours
Science	184 hours
Technical Communications	92 hours
Weldability of Metal	25 hours
Total	1325 hours

COURSE OUTLINE

Advanced Acetylene Welding — **240 hours**

Position welding, pipe welding, cast iron welding, testing of welded specimens, alloy welding and brazing, acetylene cutting, aircraft welding.

Electric Welding — **250 hours**

Position welding, pipe welding, cast iron welding, control of heat and molten metals, sheet metal welding, railroad and structural steel welding, forge practice, weld tests.

Inert Arc Welding — **130 hours**

Aluminum, stainless steel, magnesium, and cast iron.

Physical Testing of Steel and Inspection — **100 hours**

Etch test, X-ray, ASME qualifications. AWS recommended practice.

Blueprint Reading and Layout — **120 hours**

Basic lines, views, notes and specifications, dimensions, welding symbols, structural shapes, sections, detail and assembly drawings. Layout and fabrication of pipe joints—45° turns—2, 3, and 4 piece 90° turns, laterals, true "Y's", eccentric reducers, concentric reducers, tees and orange peel heads. Procedures are presented without the use of templets.

Mathematics — **184 hours**

Fractions, decimals, percentage, ratio and proportion, mensuration, algebra, geometry, trigonometry, and slide rule.

Science — **184 hours**

Basic metallurgy, chemistry, and physics which includes matter, force and motion, work energy and power, and machine and heat.

Technical Communications — **92 hours**

Basic English review, English composition, oral expression, vocabulary improvement, letters of application, note taking, and technical report writing.

Weldability of Metal — **25 hours**

Characteristics effecting weldability.

* Prerequisite—Acetylene Welder and Electric Welder

AUTO BODY REPAIRING AND REFINISHING

This course is designed to give the student a thorough knowledge of auto body repairing and refinishing. This will consist of auto mechanics pertaining to body repair and maintenance, welding, straightening, panel installations, trim and glass work, refinishing, and estimating. The student will obtain knowledge of the progressive body man.

A student who successfully completes this course will be qualified to enter the field as a junior-grade used car reconditioner, body man or refinisher. He will be qualified to set up and maintain his own business after experience is obtained in a body shop.

Length of Course ..... **2650 hours**
Duration of Course ..... **2 years**

COURSE UNITS

Hand Tools, Bench and Machine Work	100 hours
Steering, Suspension, Alignment, and Balance	200 hours
Body, Chassis and Accessories	150 hours
Electrical Systems	200 hours
Welding	200 hours
Sanding	200 hours
Masking	100 hours
Straightening	350 hours
Painting	350 hours
Color Matching and Striping	100 hours
Filling	100 hours
Panel Installations	200 hours
Interior Trim and Glass Replacements	100 hours
Estimating	100 hours
Used Car Reconditioning	100 hours
Body and Spray Tools and Equipment	54 hours
Economics and Job Procurement	46 hours
Total	2650 hours

COURSE OUTLINE

Hand Tools, Bench, and Machine Work — **100 hours**

Learning to use common tools and special tools of the trade, bench and machine tools for tapping, threading, reaming, grinding, honing, lapping and measuring.

Steering, Suspension, Alignment, and Balance **200 hours**

Complete servicing repair and adjustment of front suspension and (rear where applicable) systems. Wheel balancing. Power steering services and repairs.

Body, Chassis, and Accessories **150 hours**

Body repairs such as rattles, squeaks, leaks, etc. Servicing of various power-operated accessories such as windows, convertible tops, seats, heaters, defrosters, etc. Repair of exhaust systems; shock absorber service and other service items pertinent to body and/or chassis.

Electrical System **200 hours**

Service and repair of generators, regulators, motors, batteries, ignition systems and all other electrical components. Lighting and warning devices. Circuitry and print reading.

Welding **200 hours**

Use of oxy-acetylene equipment in cutting, welding, and heating. Use of electric arc equipment in welding and cutting.

Sanding **200 hours**

The use of sanding discs and all types of sand paper in straightening rough metal, filled surfaces, rough sanding undercoats, preparing "old finishes" and finish sanding.

Masking **100 hours**

Proper procedures and uses of all sizes of masking tape by hand and with masking or taping machines.

Straightening **350 hours**

Rough out damaged sections by pushing or pulling, etc. Hammer and dolly straightening, shrinking, stretching, and forming metal. Straightening metal with body file or disc grinder and pic hammer.

Painting **350 hours**

The uses of all types of paints such as undercoats, sealers, enamel, lacquers and acrylic lacquers. The types of thinners and reduction percentages. The use of fish-eye eliminators and anti-wrinkle reducer. The spraying of finish coats in lacquers and enamel in spot or complete refinish work. The use of rubbing compounds, polishes, and wax by hand and electric polisher.

Color Matching and Striping **100 hours**

The use of tinting colors and their effect on the original color shade. To make up a complete color. The use of paint manufacturers color matching books. How to apply stripes and the use of striping and lettering colors. The proper selection of brushes.

Filling 100 hours

How to tin and lead damaged areas. The use and application of plastic fillers. The use and time to use body putty. The procedures used in finishing these materials for primer-surfacer application.

Panel Installations 200 hours

Making repairs where complete damage prevails, such as in wrecks where tops, quarter panels, fenders, hoods, doors, etc. are damaged beyond practical repair. Making repairs where complete damage prevails due to rust and corrosion, such as rocker panels, sections of fenders and quarter panels, etc.

Interior Trim and Glass Replacements 100 hours

How interior trim of a car is removed and installed including glass mounted solid, door glass and windshields. The use of all types of cements and sealers used in auto maintenance. How to locate and repair water leaks, squeaks, and rattles.

Estimating 100 hours

The use of crash books and the systems used to determine the exact cost of any job entering the body shop.

Used Car Reconditioning 100 hours

The procedure used to clean up used cars as to motor and luggage compartments, interior and exterior finish to make cars salable.

Body and Spray Tools and Equipment 54 hours

The tools and equipment necessary to maintain a body shop. The use and care of all equipment. The materials used and their procurement.

Economics and Job Procurement 46 hours

Fundamentals of American capitalism, labor management relations, fundamentals of incentive rate setting, organization of material and procedure in seeking employment.